DOCUMENT RESUME

ED 147 395 UD 017 559

TITLE	An Analysis of the Impact of Computer Assisted Instruction on a Program Designed to Ameliorate the Effects of Racial Isolation in the Los Nietos School District.
INSTITUTION	Los Nietos Elementary School District, Calif.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	6 Oct 77
NOTE	81p.; For related documents see ED 118 110 and UD 017 550
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	*Basic Skills; *Computer Assisted Instruction; Computer Oriented Programs; *Computer Programs; Computers; *Locus of Control; *Program Descriptions; *Program Effectiveness; Program Evaluation; Success Factors; Teaching Techniques
IDENTIFIERS	*California (Los Angeles); Emergency School Aid Act

ABSTRACT

The Los Nietos School District in Los Angeles was the first school in the United States that had its basic skills program supported through intensive use of computers. Through fundings under the Emergency School Aid Act (ESAA), the program is embarking on its third year. The system initially supported 17 typewriter-style terminals, but before the end of the year the number was increased to 24. The system supported the following courses: Arithmetic Proficiency Training Program, Elementary Reading Skills, and WRITE. The system was affected by slow response time and software problems and the courses shifted to Elementary Reading Skills (grades 3-6), Elementary Arithmetic (Grades 1-7), and Elementary Language Arts (Grades 3-6). In the evening hours, the system was used with adult reading, math, and language skills. Computer Assisted Instruction (CAI), it has been shown, is an effective medium for building internal control in the child who believes that his life is controlled by external forces. It also appears that CAI is a valuable medium of instruction in school districts that are in the process of desegregation. Teachers have reported that pupils who have been the most difficult to handle appear to be particularly attracted to the medium of CAI. (Author/AM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED147395

LOS NIETOS SCHOOL DISTRICT

CAI: IT'S ROLE IN THE EDUCATION OF MINORITIES

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Nelson P. Crandall
Los Nietos School Dist

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

BOARD OF TRUSTEES

Rodolfo Lopez
President

Edward Garcia
Member

Manfred Bartch
Vice President

Jenny van Daalen Wetters
Member

Roy Salas
Clerk

Martin Montano, Superintendent/
Secretary to the Board

ED017559

AN ANALYSIS OF THE IMPACT OF COMPUTER ASSISTED INSTRUCTION ON A PROGRAM DESIGNED TO AMELIORATE THE EFFECTS OF RACIAL ISOLATION IN THE LOS NIETOS SCHOOL DISTRICT

Funded by the United States
Office of Education, DHEW

These data are submitted as part of the testimony presented to the House Committee on Domestic Applications of Science and Technology, October 6, 1977.

Nelson D. Crandall, Ed.D.
Project Director

Martin C. Montaño, Ed.D.
District Superintendent

TABLE OF CONTENTS

I	C A I	1
II	Description of Program.	8
III	Recommendations	22
IV	Bibliography.	23
V	Statistical Data.	24

CRANDALL, Nelson David, Ed.D

Business Address: LOS NIETOS SCHOOL DISTRICT
8324 South Westman Avenue
Whittier, CA 90606

Residence Address: 5603 East Seaside Walk
Long Beach, CA 90803

Date of Birth: December 10, 1924

EDUCATIONAL TRAINING

Ed.D., Education Administration	U S C	1970
Administrative Specialist Degree	U S C	1968
Education Administration, M.A.	C S U L B	1955
Elementary Education, B.A.	C S U L B	1951

EMPLOYMENT EXPERIENCE

ESAA Director, Los Nietos School District	1974 -
Principal, Ada S. Nelson School Los Nietos School District	1972 - 1974
Director, Research and Teacher Education (RATE) Project, Los Nietos School District	1969 - 1972
Principal, Los Nietos School District	1958 - 1969
Principal - Superintendent, Newcastle School District Newcastle, California	1955 - 1958
Teacher, Sixth Grade Auburn, California	1953 - 1955
Teacher, Fourth Grade Long Beach, California	1951 - 1953

CONSULTANT

Montebello Unified School District	1970
Las Virgenes Unified School District	1971
Ventura Unified School District	1975
Pasadena Unified School District	1969-70-71
State Department of Education	1975-76

LECTURER

University of Southern California	1965 (Summer)
University of California at Los Angeles Extension	1970 (Summer)

PART TIME INSTRUCTOR

Pepperdine University	1974 - 1975
Rio Hondo College	1974 - 1975

PROFESSIONAL ORGANIZATIONS

Membership

Association of California School Administrators
National Association of Elementary School Principals
National Education Association
Phi Delta Kappa

Board Member

ACSA, Region 15

Chairmanship

ACSA Committee on Elementary Administration
USC-ACSA State-wide Conference
"The Computer and the Elementary School"

Membership
State Department of Education
State of California

State Task Force of Computer Assisted Instruction
State Advisory Committee on Educational Technology

PUBLICATIONS

"Teacher Aides Really Do Aid!"
California School Board, November 1970

"How Teacher Aides Help Teachers",
American Education, October, 1971 (Reprinted in Education Digest)

"The Role of Computer Assisted Instruction in the Education of Ethnic Minorities",
Journal for the Association for the Development of Computer Based Instructional Systems, Winter, 1976.

"CAI as a Tool for Building Internality in Traditionally Low Achieving Students",
Educational Technology (Accepted for Publication)

"CAI: Its Role in the Education of Ethnic Minorities"
The Journal: Technological Horizons in Education, December, 1976

I. COMPUTER ASSISTED INSTRUCTION

"CAI: IT'S ROLE IN THE EDUCATION OF ETHNIC MINORITIES"
OF
Nelson D. Crandall, Ed.D.

About ten years ago, the federal government undertook a massive program to wipe out poverty in America. The thrust of the program was towards those ethnic minorities that comprised the bulk of the poor. Particular emphasis was placed on the American of Mexican descent, the Black American and the American Indian. Further references to minority groups in this paper shall pertain only to these groups as that is where the data has been collected.

A central hypothesis of this program was that poverty is closely linked to failure in school on the part of minority children. Massive amounts of money have been poured into the educational institutions of the nation to achieve this goal. In spite of the best efforts of our nation's educators and the good intentions of the programs, these efforts have failed according to the goals and objectives set by the program directors.

So massive was the failure that it has caused educators to engage in considerable soul searching and ask themselves, "Just what can the school accomplish? What is beyond the reach of the schools?"

In its comprehensive study, the Center for Educational Policy Research at Harvard University reported, "There is no evidence that school reform can substantially reduce the extent of cognitive inequality, as measured by tests of verbal fluency, reading comprehension, or mathematical skill. Eliminating qualitative differences between elementary schools would reduce the range of scores in sixth grade by less than three percent. Eliminating qualitative differences between high schools would hardly reduce the range of twelfth-grade scores at all and would reduce by only one percent the disparities in the amount of education people eventually get."

One of its gloomy conclusions, "Our research suggests that the character of a school's output depends largely on a single input, the characteristics of the entering child. Everything else - the school budget, its policies, the characteristics of the teachers - is either secondary or completely irrelevant, at least so long as the range of variation among schools is as narrow as it seems to be in America." (Jencks 1972.)

In the field of compensatory education, practitioners have been led by a succession of Messiahs who showed them the way. Each time the promised results did not materialize, yet the practices have lingered for want of something better.

As a result, educators have become increasingly skeptical of programs claiming success in raising achievement levels with children from a poverty background. To the uninitiated, proposing that achievement levels may be raised in children by having them sit in front of a computer terminal for fifteen minutes a day seems ludicrous. But, the facts are in. Standardized test scores have soared with children doing drill and practice on a daily basis using CAI. Those of us in elementary education who witnessed this phenomenon asked ourselves,

"Why should CAI raise test scores when special reading teachers and teacher aides don't appear to be able to accomplish this? Why do reading scores go up when the child is taking arithmetic on CAI? Why do the slowest pupils make a significant jump in achievement when in other programs he continues to fall further behind?"

LOCUS OF CONTROL

The answers to these questions can be found when one examines children from homes with a heritage of poverty in the light of a concept called Locus of Control. This term refers to how the child perceives himself controlled. The internally controlled child perceives that he is in control of his own destiny, that his achievements are usually comensurate with his efforts, and that he can reach most goals that he sets for himself. The externally controlled child believes that his life is controlled by outside forces. He believes that what happens to him is the result of destiny, fate, luck, chance, the intervention of powerful others, or acts of God.

It is quickly evident that the child who perceives that there is no relationship between his own efforts and his achievements is under a tremendous handicap. Many of these children believe that there is no way they can help themselves succeed so they spend their time in trying to avoid failure. They do this by avoiding themselves either physically or psychologically from most learning situations.

The internal child, on the other hand, has learned to savor success. He spends his time putting himself in situations where he can succeed and once again know the pleasure that comes with success.

It appears that internality can be fostered by activities that can 1) allow the child to establish a cause-and-effect relationship with his own actions, and 2) relate these activities without the intervention of a "powerful other" (teacher, aide, parent).

There is good evidence that reinforcement to learning activities is not effective if the child does not perceive a causal relationship between his own actions and the feedback that occurs. Studies have shown that low achieving children and often minority children perceive themselves as not having much control over their own fate. They perceive what happens to them as a result of who their friends are, what color their skin is, how much money their folks have, luck, etc.

In constructing a social learning theory, J. B. Rotter (1966) stated: "When a reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labled this a belief in external control. If the person perceives that the event is contingent on his own relatively permanent characteristics, we term this a belief in internal control".

The Coleman Report (1966) found that this belief in destiny was a major determinant in school achievement. They concluded that this pupil attitude factor had a stronger relationship in achievement than all other school factors together.

Computer Assisted Instruction has shown convincing evidence that it is an effective medium for building internal control in the child who believes that his life is controlled by external forces.

The child in question typically has poor tolerance to delayed gratification. He usually sees minimal relationship between his actions of today with success or failure as represented by marks on a report card. The computer terminal, with its one or two second response time, graphically shows the pupil immediate feedback to his input. He knows he is in control and can readily see the cause and effect relationship to his actions.

Vasquez (1974) sees the understanding of cause-effect relationship as essential to internal attribution of success or failure on the part of the child. This understanding has not been developed adequately in the mind of the external individual because of negative social experiences within a culturally biased classroom. The problem then is how to build understanding of cause-and-effect in the externally controlled child.

Vasquez suggests four criteria by which to evaluate activities to accomplish understanding of the cause-effect relationship:

1) See that the cause has sufficient power to produce the effect.

2) Students should comprehend that without the cause, the action or result would not have occurred.

3) Other equally likely causes must not be present if we are to identify a single cause.

4) The cause must precede the event in time.

When judged by the above criteria, Computer Assisted Instruction gets high marks. Let us examine each of the above as compared with CAI.

(A) Sufficient Power. It is difficult to conceive of any medium that would have more power. Whenever the pupil indicates he has finished his input to the computer, there is almost instantaneous response that is solely related to the input.

(B) Cause-effect relationship. On CAI, the child instantly recognizes the relationship of the output to his input.

(C) Other causes. The interaction between the child and the terminal is direct, without the intervening intermediary of the teacher or others. The child must take full responsibility or credit for the response whatever it is.

(D) Temporal relationship. The immediate feedback provided by the computer is unexcelled. The computer usually responds within one or two seconds to the pupil's input.

There is much research to be done to determine the extent that CAI modifies the locus of control of the minority child. Emperical evidence suggests that there is substantial change. Hard data shows that there is highly significant growth in reading and math as measured by standardized tests. For example, Bone (1974) reported an average growth of 1.1 years growth over an eight-month period in Chicago's inner city where the average growth had been close to .4 years growth in math for the period covered. Similar results have been reported from University of Akron, Stanford University, and from Montgomery County, Maryland.

Speculation as to why Computer Assisted Instruction gives evidence of increased internality has included the following points:

(1) Immediate feedback.

(2) Lack of external variables to which a student might attribute his success or failure.

(3) The very specific directions that the computer gives the learner, and the computer's low tolerance for deviation from the directions.

(4) The one-to-one relationship between the learner and the terminal.

(5) The programmed success that the pupil experiences on most CAI courseware.

Instructional Logistics

Accompanying racial integration in schools, there has been an ever-widening span of experiences, competencies, levels of achievement, and ability. In order to effectively teach such diverse groups, teachers

have been told to individualize their instruction.

Seldom has there been a harder working group of teachers than those attempting to individualize their classrooms in schools such as we have described above. Despite these heroic efforts, they are unable to meet the goals that they have set for themselves despite special materials, paraprofessional help, subject matter specialists and parent volunteers. Teachers are being overwhelmed by the logistics of instructing such classes. Without special help, teachers are destined to direct the bulk of their instruction towards the mean achievement level of the group. In the past, such instruction has been satisfactory for homogeneous grouping. It is highly inadequate for a school in the process of racial integration as it results in pupil frustration and parent dissatisfaction. Needless to say, the teacher in such a setting is highly upset and can often be found in the personnel office filling out a transfer request.

At first glance, it appears perfectly feasible to individualize these subjects for thirty children. If we only did it with reading and arithmetic it would appear that at most the teacher would have sixty lessons in any one day. This is an illusion. Reading and arithmetic are nothing but names that we have given to a large assortment of complex skills. Should we break down these subjects into a minimal number of skill areas or "strands", we suddenly find that the teacher has about twenty-five areas to prepare for; and instead of a potential of sixty lessons, it has ballooned to seven hundred and fifty.

What has become an impossible task for the teacher is duck soup for the computer. Thousands of children throughout the nation are having their drill and practice lesson plans prepared for them daily in heterogeneously organized classrooms. They are highly successful. Teachers and parents are pleased at the results that are evident from the child's academic achievement and social adjustment.

Over a thousand terminals are now operating in classrooms of Los Angeles County alone.

In the Los Nietos School District, CAI is being implemented in five schools, grades four through eight. Teachers have remarked on the enthusiasm of the children towards the terminals and the change in attitudes that have accompanied the implementation of the program.

Teachers have reported that pupils who have been the most difficult to handle appear to be particularly attracted to the medium of CAI.

Evaluation of an innovation such as this is especially difficult to measure because of the number of uncontrolled variables involved. The following evidence has been observed and appears to have a relationship with CAI.

Scores on standardized test are sharply up.

Truancy and tardiness are down.

Children make intensive use of the computer terminals before and after school.

Vandalism of the school plants is down.

It appears that CAI is a valuable medium of instruction in school districts that are in the process of desegregation. One of the major obstacles has been the achievement of those children suffering the effects of racial isolation is often significantly lower than those children in the majority group. As CAI effectively brings up the achievement level of the lower quartile pupils, there is a reduction in the frustration level, the self-confidence of the pupil improves, and the general emotional climate of the institution is improved.

LOS NIETOS EDUCATION CENTER
COMPUTER CENTER

THE RELATIONSHIP BETWEEN CAI AND ACHIEVEMENT

All districts are cautious about claiming earned gains on standardized tests being attributable to certain programs. Los Nietos is no exception. However, the scores on the following pages do show highly significant gains made during a period when the only identifiable variable was the introduction of CAI. The district gains confidence in attributing these gains to CAI in that similar results have been found in Chicago, Montgomery County Maryland, Kansas City and the Los Angeles County program.

ACADEMIC GROWTH

The growth that children made in math and reading as measured by standardized tests has been dramatic and graphic. The tests were administered by the classroom teachers over a four year span beginning in October, 1974. The instrument used was the California Achievement Test of Basic Skills. The children marked their answers on "mark sense" data processing answer sheets. These were processed and tabulated by the Los Angeles County Superintendent of Schools Office.

The accompanying graphs and charts will attest to the significant growth that the children have made in the basic skills of reading and math. It can also be pointed out that these results were obtained while the percentage of minority population was growing. At the present time the school population is about eighty percent minority, principally Spanish surname.

II. DESCRIPTION OF PROGRAM

A REPORT OF AN ELEMENTARY INSTRUCTIONAL SYSTEM SUPPORTED WITH COMPUTER-ASSISTED INSTRUCTION IN DRILL AND PRACTICE IN THE BASIC SKILLS

The Los Nietos School District in Los Angeles County has the distinction of being the first school in the United States that has had their basic skills program supported through intensive use of computers.

This publication fulfills the obligation incurred upon receiving a grant under the Emergency School Aid Act; that of dissemination of successful practices for relieving ethnic segregation, and ameliorating the effects of racial isolation.

History of the Project

The Los Nietos ESAA Basic Program was the first program of computer assisted instructional program funded under Public Law 92-318, The Emergency School Aid Act. Approved for the school year 1974-75, the project became operational with the installation of an IBM 370 115 computer dedicated to computer assisted instruction, on January 5, 1975. The system initially supported seventeen 2741 typewriter-style terminals. Before the end of the year this number was increased to twenty-four. The system ran on Coursewriter III, an IBM instructional language, and supported the following courseware:

Arithmetic Proficiency Training Program (Gr. 2 - 9)
Elementary Reading Skills, CCC (Gr. 3 - 6)
WRITE, Poughkeepsie Schools, (Gr. 4 - 9)

Although the early results were excellent, the system was plagued by slow response time and software problems. The necessity to maintain our own software plus the inability of the system to support an adequate number of terminals resulted in the termination of the IBM lease in October, 1976 and a conversion to equipment and programs leased from the Computer Curriculum Corporation, Palo Alto.

We started the year with two CCC A16 computers supporting 32 CRT-type terminals running the following courseware:

Cont'd

Elementary Reading Skills (Gr. 3 - 6)
Elementary Arithmetic (Gr. 1 - 7)
Elementary Language Arts (Gr. 3 - 6)

In the evening hours, the system was used with adult reading, math, and language skills. This was administered under adult education programs.

HOW CAI IS USED TO SUPPORT TEACHERS IN DRILL AND PRACTICE

For the purpose of this subject, let us assume that we accept the following paradigm as the one being used to teach the basic skills:

Step 1. Teachers introduce concepts to children on the basis of their readiness for that particular concept and in a sequence that involves certain prerequisite skills.

Step 2. Upon the child achieving basic comprehension of a concept, the child is given drill and practice to achieve greater understanding and to gain mastery of the concept.

Step 3. Achieving mastery of the skill, the child is given contrived applications, direct purposeful applications, or utility of the skill to master more complex concepts.

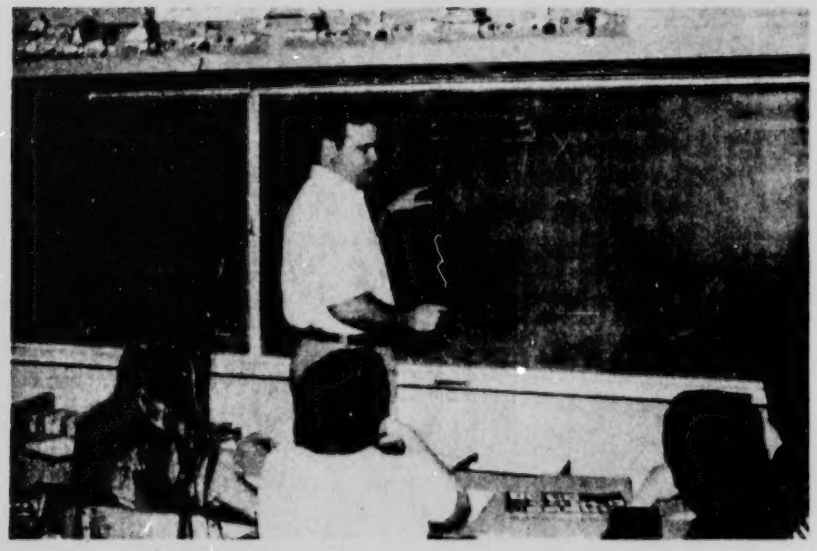
Step 1. Traditionally we think of the teacher explaining the concept (such as contractions in grammar or division in math) with the aid of the blackboard, visuals, or printed matter.

Step 2. The dominant teaching aid for achieving mastery has been the liquid spirit duplicating machine. Teachers pass out exercises for the children to do that are hopefully at their level of achievement. Other aids have been workbooks, teacher made materials, games, and exercises taken from textbooks.

Cont'd

Step 3. The application level can be found in dramatic play of social studies, thought problems from math books, and contrived experiences in the classroom.

Computer Assisted Instruction takes over the function outlined in "Step 2". Computers are uniquely qualified to achieve the aims of drill and practice because they can store and recall vast amounts of information. The programs of Computer Curriculum Corporation, the most widely used software, tract the child in twenty-eight different skill strands simultaneously. When the child achieves ninty percent correct in any one strand, the program advances him. When the child achieves less than eighty percent correct, the pupil is given less demanding work. Thus in a class of thirty pupils, 840 skill strands are being tracked at the same time.



IT STARTS IN THE CLASSROOM The teacher introduces the concept. No computer can come close to the interaction that is necessary for that type of interaction needed for this type of teaching. Other media is usually employed to facilitate communication at this point such as the blackboard, pictures, exhibits, etc.

The children become aware of the concept, gaining the basic knowledge involved, and then move to the level of comprehension.

Gaining comprehension, the children are then ready to begin the process of achieving mastery. Traditionally this is done in the classroom with ditto material, workbooks or copying exercises out of the textbooks.

This has always been a difficult area to individualize work for the child. In a fully integrated heterogenious classroom it becomes a logistical nightmare. Few teachers have the skills, the time, and the commitment to completely individualize in a diagnostic-prescriptive setting.

Where the teacher is highly skilled in communicating and perceiving feedback, the computer is highly skilled at remembering an infinite amount of data, storing this information, and recovering it quickly and accurately.

THE COMPUTER DOES ITS PART Working at grade level initially assigned by the teacher, the pupils do drills and practice on those processes that they comprehend from their classroom work. The children are tracked in as many as twenty-eight skills strands by the computer simultaneously.

This medium appears to have considerable charisma for the children. Some of their comments:

"The terminal does what I tell it to do."

"I know that I did the work myself."

"The computer never bawls me out."

"I get good scores on CAI."

"It's fun."

"Nobody but me knows what I am doing."

"I learn real good on the computer."

"You know that you do it."

"I like to beat the computer."

The children's actions reenforce their words. The terminals are busy during lunch time, before school, after school and during vacation periods.

Parents of primary children often bring their children in after regular hours and sit with them at the terminals.

TEACHER FEEDBACK In addition to teacher observation of children at work with the terminals, the teacher can generate printed reports on demand. These reports show where the child is working in any of the subjects areas, expressed by grade level, e. g. Literal Comprehension 3.7.

The teacher may then refer to the teachers guide for that particular subject and see what concepts the child will need to understand to proceed further. If a teacher notices that a child is not progressing in a particular strand, this is a clue that the pupil lacks real comprehension of the concept.

Class reports are useful in grouping children for small group learning centers to meet common needs. Individual reports are often used to counsel the pupil and in parent conferences.

APPLICATION After the teacher has received evidence from the computer printouts that the child has achieved mastery of a given skill, it is incumbent on him to assign projects that permit the child to utilize these newly mastered skills so that they have meaning and value.

Newly mastered skills are also utilized as component parts for more highly organized skills that are in reality syntheses of subordinate skills. For example, evidence that the child has mastered vertical subtraction and horizontal multiplication indicates to the teacher that the child has the necessary skills to master division and can begin introduction of this concept.

The retention of any skill mastered is dependent upon review and application; use it or lose it.

WHY CAI IS SUCCESSFUL

Locus of Control

Educators scanning test results of children working with CAI for the first time are struck with an anomoly. They see children who have scored in the lowest quartile suddenly spurt forward. Two or three years growth in one year is the rule for these children rather than the exception.

This is against our past experience and leads us to ask why should they suddenly surge ahead when traditionally they have fallen further behind each year?

The answers to these questions can be found when one examines children from homes with a heritage of poverty in the light of a concept called Locus of Control. This term refers to how the child perceives himself controlled. The internally controlled child perceives that he is in control of his own destiny, that his achievements are usually commensurate with his effotts, and that he can reach most goals that he sets for himself. The externally controlled child believes that his life is controlled by outside forces. He believes that what happens to him is the result of destiny, fate, luck, chance, the intervention of powerful others, or acts of God.

It is quickly evident that the child who perceives that there is no relationship between his own efforts and his achievements is under a tremendous handicap. Many of these children believe that there is no way they can help themselves succeed so they spend their time in trying to avoid failure, thus, removing themselves either physically or psychologically from most learning situations.

The internal child, on the other hand, has learned to savor success. He spends his time putting himself in situations where he can succeed and once again know the pleasure that comes with success.

It appears that internality can be fostered by activities that can 1) allow the child to establish a cause-and-effect relationship with his own actions, and 2) relate these activities without the intervention of a "powerful other" (teacher,

Cont'd

aide, parent).

There is good evidence that reinforcement to learning activities is not effective if the child does not perceive a causal relationship between his own actions and the feedback that occurs. Studies have shown that low achieving children and often minority children perceive themselves as not having much control over their own fate. They perceive what happens to them as a result of who their friends are, what color their skin is, how much money their folks have, luck, etc.

In constructing a social learning theory, J. B. Rotter (1966) stated: "When a reinforcement is perceived by the subject as following some action of his own, but not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labeled this a belief in external control. If the person perceives that the event is contingent on his own relatively permanent characteristics, we term this a belief in internal control".

The Coleman Report (1966) found that this belief in destiny was a major determinant in school achievement. They concluded that this pupil attitude factor had a stronger relationship in achievement than all other school factors together.

Computer Assisted Instruction has shown convincing evidence that it is an effective medium for building internal control in the child who believes that his life is controlled by external forces.

The child in question typically has poor tolerance to delayed gratification. He usually sees minimal relationship between his actions of today with success or failure as represented by marks on a report card. The computer terminal, with its one or two second response time, graphically shows the pupil immediate feedback to his input. He knows he is in control and can readily see the cause and effect relationship to his actions.

Cont'd

Vasquez (1974) sees the understanding of cause-effect relationship as essential to internal attribution of success or failure on the part of the child. This understanding has not been developed adequately in the mind of the external individual because of negative social experiences within a culturally biased classroom. The problem then is how to build understanding of cause-and-effect in the externally controlled child.

Vasquez suggests four criteria by which to evaluate activities to accomplish understanding of the cause-effect relationship:

1) See that the cause has sufficient power to produce the effect.
2) Students should comprehend that without the cause, the action or result would not have occurred.
3) Other equally likely causes must not be present if we are to identify a single cause.
4) The cause must precede the event in time.

When judged by the above criteria, Computer Assisted Instruction gets high marks. Let us examine each of the above as compared with CAI.

A) Sufficient Power. It is difficult to conceive of any medium that would have more power. Whenever the pupil indicates he has finished his input to the computer, there is almost instantaneous response that is solely related to the input.

B) Cause-effect relationship. On CAI, the child instantly recognizes the relationship of the output to his input.

C) Other causes. The interaction between the child and the terminal is direct, without the intervening intermediary of the teacher or others. The child must take full responsibility or credit for the response whatever it is.

D) Temporal relationship. The immediate feedback provided by the computer is unexcelled. The computer usually responds within one or two seconds to the pupil's input.

Cont'd

There is much research to be done to determine the extent that CAI modifies the locus of control of the minority child. Emperical evidence suggests that there is substantial change. Hard data shows that there is highly significant growth in reading and math as measured by standardized tests. For example, Bone (1974) reported an average growth of 1.1 years growth over an eight-minth period in Chicago's inner city where the average growth had been close to .4 years growth in math for the period covered. Similar results have been reported from University of Akron, Stanford University, and from Montgomery County, Maryland.

Speculation as to why Computer Assisted Instruction given evidence of increased internality has included the following points:

1) Immediate feedback
2) Lack of external variables to which a student might attribute his success or failure
3) The very specific directions that the computer gives the learner, the computer's low tolerance for deviation from the directions
4) The one-to-one relationship between the learner and the terminal
5) The programmed success that the pupil experiences on most CAI courseware.

Instructional Logistics

Accompanying racial integration in schools, there has been an everwidening span of experiences, competencies, levels of achievement, and ability. In order to effectively teach such diverse groups, teachers have been told to individualize their instruction.

Seldom has there been a harder working group of teachers than those attempting to individualize their classrooms in schools such as we have described above. Despite these heroic efforts, they are unable to meet the goals that they have set for themselves despite special materials, paraprofessional help, subject

matter specialists and parent volunteers. Teachers are being overwhelmed by the logistics of instructing such classes. Without special help, teachers are destined to direct the bulk of their instruction towards the mean achievement level of the group. In the past, such instruction has been satisfactory for homogeneous grouping. It is highly inadequate for a school in the process of racial integration as it results in pupil frustration and parent dissatisfaction. Needless to say, the teacher in such a setting is highly upset and can often be found in the personnel office filling out a transfer request.

At first glance, it appears perfectly feasible to individualize these subjects for thirty children. If we only did it with reading and arithmetic it would appear that at most the teacher would have sixty lessons in any one day. This is an illusion. Reading and arithmetic are nothing but names that we have given to a large assortment of complex skills. Should we break down these subjects into a minimal number of skill areas or "strands", we suddenly find that the teacher has about twenty-five areas to prepare for; and instead of a potential of sixty lessons, it has ballooned to seven hundred and fifty.

What has become an impossible task for the teacher is duck soup for the computer. T ousands of children throughout the nation are having their drill and practice lesson plans prepared for them daily in heterogeneously organized classrooms. They are highly successful. Teachers and parents are pleased at the results that are evident from the child's academic achievement and social adjustment.

Over a thousand terminals are now operating in classrooms of Los Angeles County alone.

In the Los Nietos School District, CAI is being implemented in five schools, grades four through eight. Teachers have remarked on the enthusiasm of the children towards the terminals and the change in attitudes that have accompanied the implementation of the program.

Teachers have reported that pupils who have been the most difficult to handle appear to be particularly attracted to the medium of CAI.

Cont'd

Evaluation of an innovation such as this is especially difficult to measure because of the number of uncontrolled variables involved. The following evidence has been observed and appears to have a relationship with CAI.

Scores on standardized test are sharply up.
Truancy and tardiness are down.
Children make intensive use of the computer terminals before and after school.
Vandalism of the school plants is down.

It appears that CAI is a valuable medium of instruction in school districts that are in the process of desegregation. One of the major obstacles has been the achievement of those children suffering the effects of racial isolation is often significantly lower than those children in the majority group. As CAI effectively brings up the achievement level of the lower quartile pupils, there is a reduction in the frustration level, the self-confidence of the pupil improves, and the general emotional climate of the institution is improved.

III. RECOMMENDATIONS

RECOMMENDATIONS FOR THE COMMITTEE

1) As the emergence of electronic data processing has been very rapid, there is almost a vacuum of expertise in CAI and CMI in the teacher's colleges of the nation. Incentives are needed for professors of educational technology to become current in theory and practice of this field.

2) That federal aid to education through the various categorical fundings be diverted from less successful approaches into CAI.

3) That programs be initiated to change large population groups from an orientation of "external control" to a posture where they see themselves realistically; and to aid them in becoming self-actualizing individuals. Such groups, presently gripped in poverty and dependency, could then become contributing members of our society. Welfare roles, disease, crime, and poor personal performance could significantly be changed for the better with relatively modest cost.

IV. BIBLIOGRAPHY

BONE, Jan, "Turning on With CAI", American Education, November, 1974, P. 32, Vol. 10, eo. 9. United States Office of Education.

COLEMAN, J. S., CAMPBELL, E. Q., HOBSON, D. J., McFARLAND, J., MOOD, A. M., WEINFIELD, F. D., and YORK, R. T., EQUALITY OF EDUCATIONAL OPPORTUNITY. (Superintendent of Documents, Catalog No. FS5.238:38001) Washington, D. C.: United States Office of Education, 1966.

JENCKS, Christopher and Mary Jo Bane, "The Schools and Equal Opportunity, Saturday Review of Education, September 16, 1972, p. 37.

ROTTER, J. B., Generalized expectancies for internal versus external control of reinforcement. PSYCHOLOGICAL MONOGRAPHS, 1966, 80 (1, Whole No. 609).

VASQUEZ, James A., "Locus of Control Learning and Implications for Educators". An Unpublished Manuscript presented at the General Assistance Center, 1974 San Francisco, California 94103.

VASQUEZ, James, "Learning in Relation to Desegregated Classrooms", STRIDE, June, 1975, General Assistance Center, San Francisco, California.

V. STATISTICAL DATA

NARRATIVE SUMMARY
OF
LONGITUDINAL AND CROSS SECTIONAL DATA

The longitudinal data show quite convincingly that students in the Los Nietos School District have made significant achievement gains over the past four years.

Students in the Fourth, Fifth and Sixth grades whose average achievement was between the 04%ile to 17%ile in Math four years ago are now achieving approximately 30%ile points higher. Similar, though not so dramatic gains have been achieved in Reading. Fourth, Fifth and Sixth grade students have risen from the 15%ile to the 38%ile. (See figures 27 to 36 .)

Another way of studying the longitudinal data is to look at the differences in achievement levels for a selected grade level over a period of years. This is generally referred to as cross-sectional data. For example, over the past three years, the math achievement of graduating 8th graders has risen from the 35%ile to the 47%ile. Significant gains have also occurred in the fourth through seventh grades. Again, similar yet less dramatic results have been achieved in reading. Reading achievement has risen from the 35%ile to the 40%ile for graduating 8th graders over the past three years. (See figures 37 to 48 .)

This year, an attempt is being made to implement a comprehensive evaluation project. This will lead to more specific statistical information regarding the extent to which CAI (and other programs) have contributed to the marked successes of students in the Los Nietos School District.

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL TEST DATA
CALIFORNIA TEST OF BASIC SKILLS (CTBS)

TOTAL READING MEAN PERCENTILE SCORES

8th Grade Class	1974-75	October 1973 - 14%ile	May 1975 - 35%ile
8th Grade Class	1975-76	October 1973 - 17%ile	May 1976 - 37%ile
8th Grade Class	1976-77	October 1973 - 15%ile	May 1977 - 40%ile
7th Grade Class	1976-77	October 1973 - 10%ile	May 1977 - 36%ile
6th Grade Class	1976-77	October 1974 - 16%ile	May 1977 - 37%ile

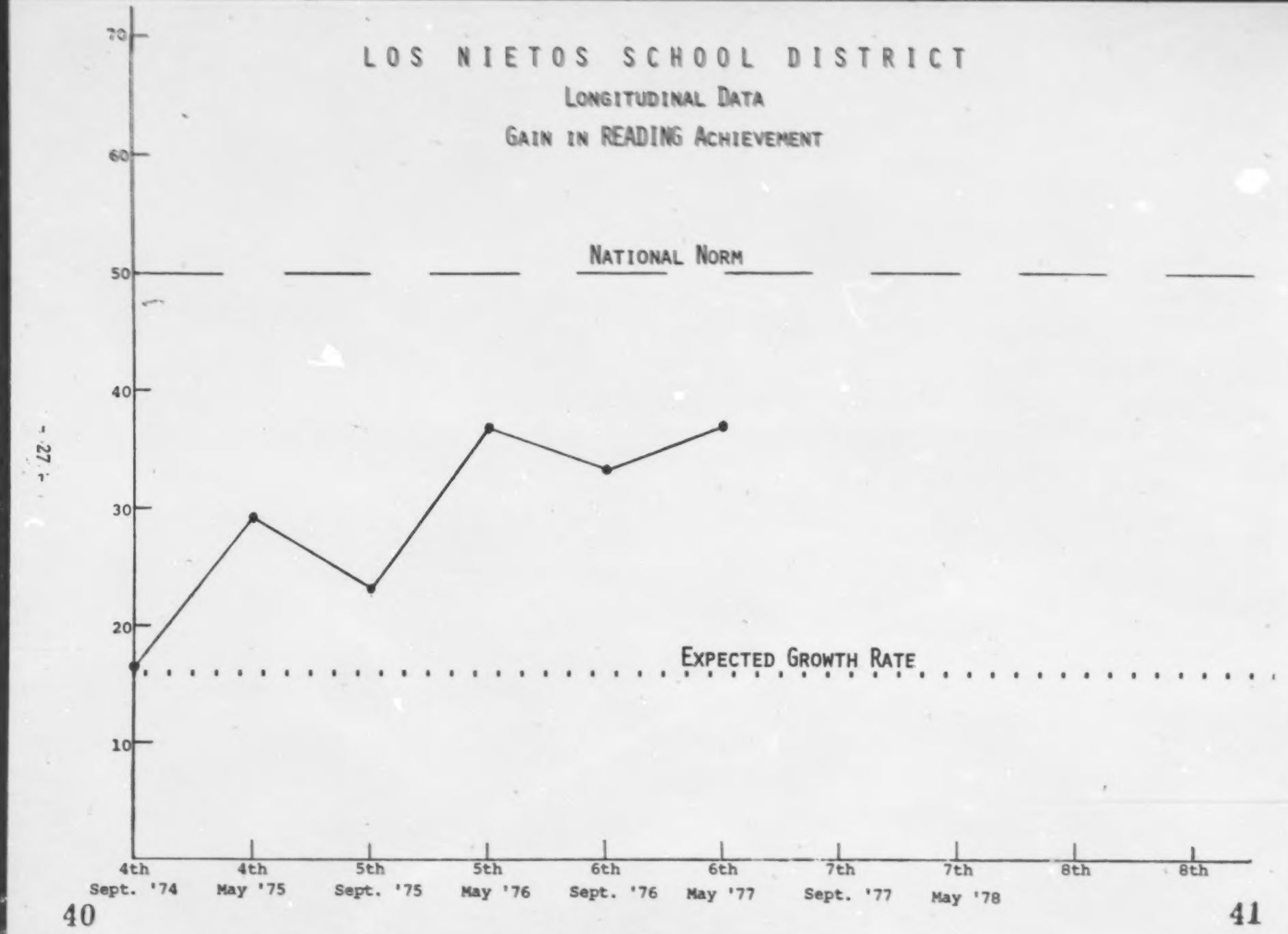
TOTAL MATH MEAN PERCENTILE SCORES

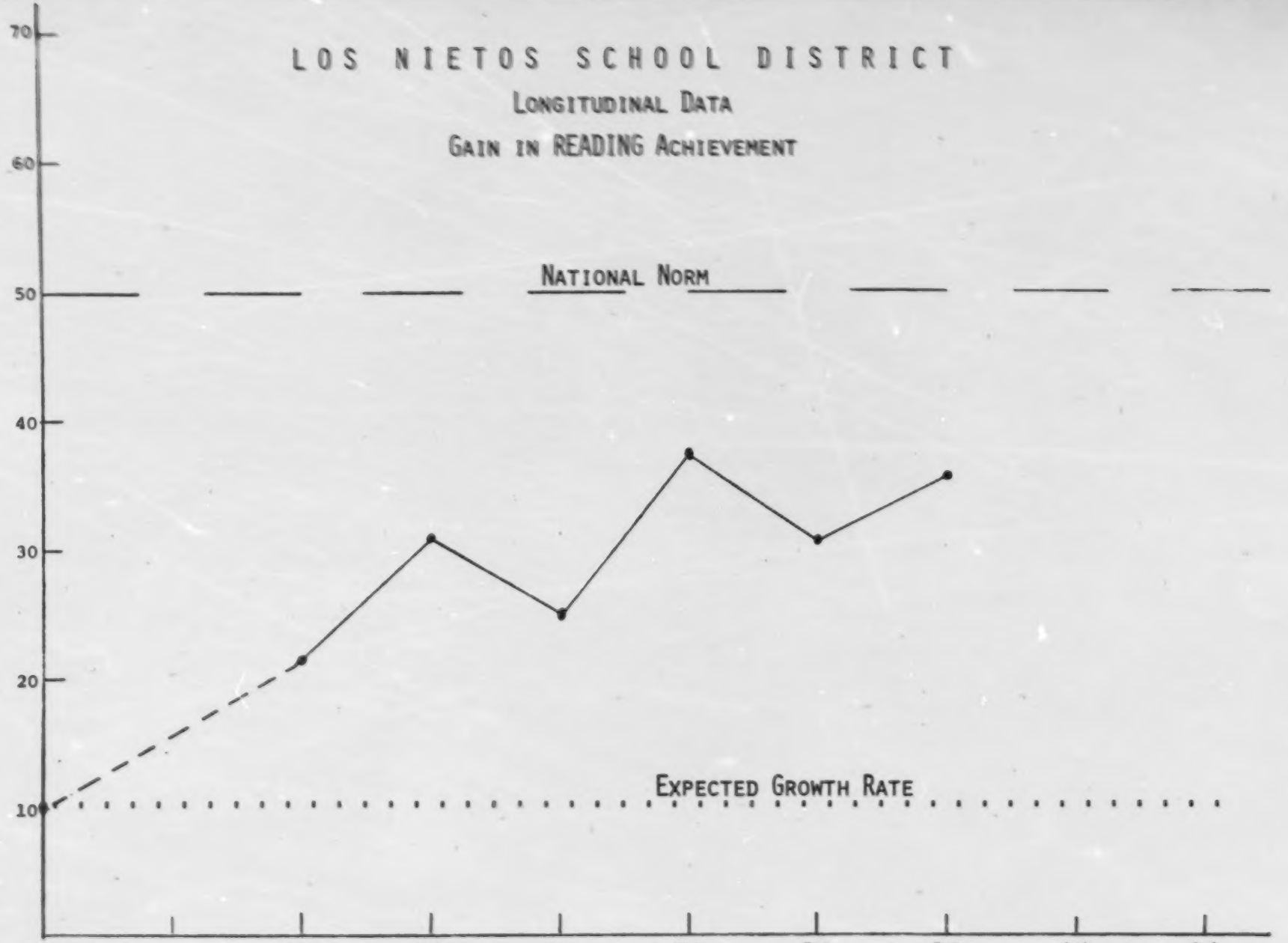
8th Grade Class	1974-75	October 1973 - 11%ile	May 1975 - 35%ile
8th Grade Class	1975-76	October 1973 - 15%ile	May 1976 - 42%ile
8th Grade Class	1976-77	October 1973 - 09%ile	May 1977 - 47%ile
7th Grade Class	1976-77	October 1973 - 04%ile	May 1977 - 47%ile
6th Grade Class	1976-77	October 1974 - 16%ile	Oct.1977 - 39%ile

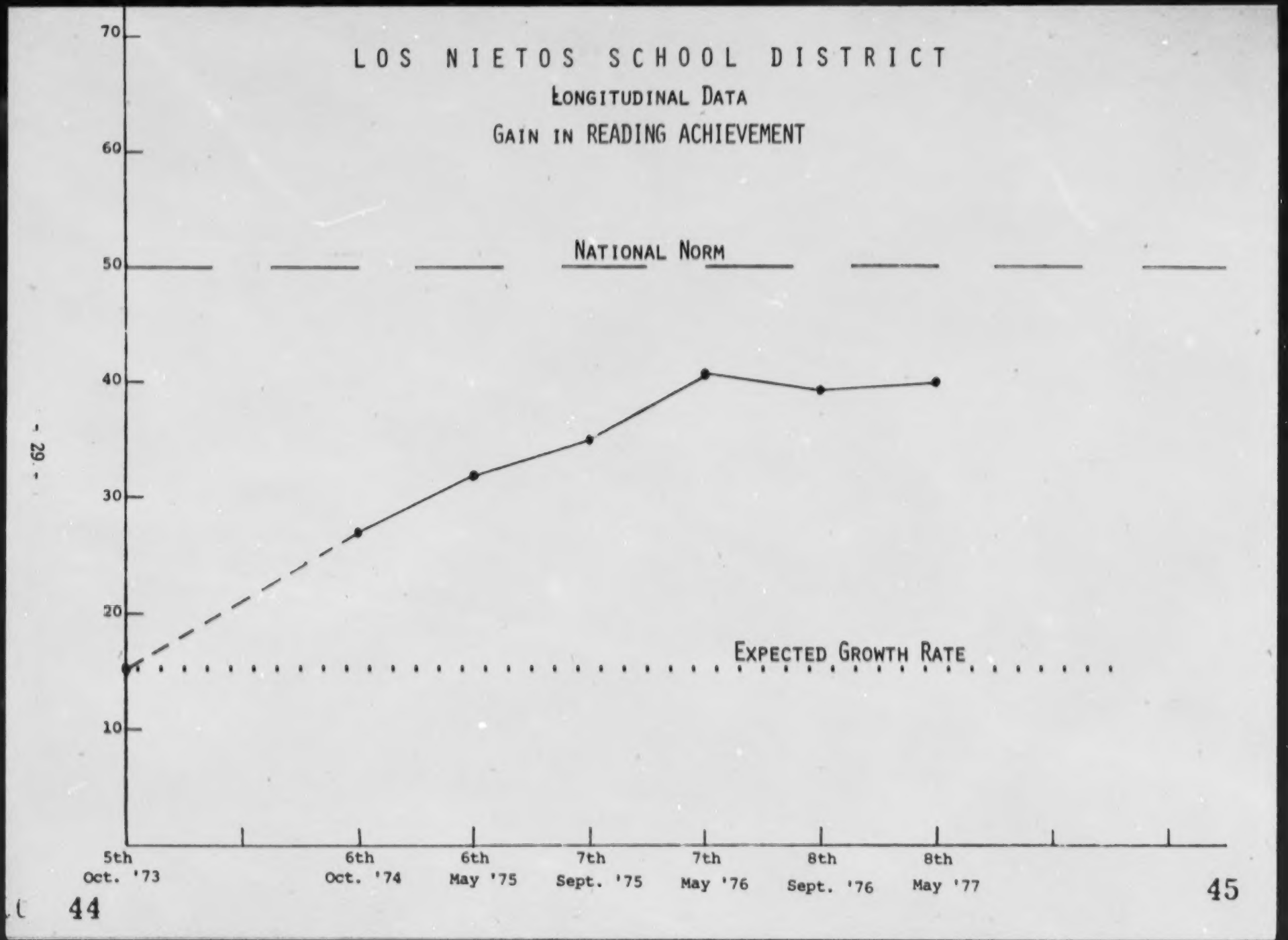
CTBS MEAN SCORE
SPRING OF YEAR

LOS NIETOS SCHOOL DISTRICT

Grade Level Equivalents Longitudinal Group		READING				LANGUAGE				MATHEMATICS					TOTA BATTE
		Vocab	Comp	G.E. Total	% ile	Mech	Express	Spell	Total	Comput	Concepts	Appl	G.E. Total	% ile	
1st Grade	1974	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA		NA
2nd Grade	1975	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA		NA
3rd Grade	1976	3.1	3.1	3.3	38	2.9	3.1	2.9	2.9	3.5	3.0	3.1	3.4	38	3.1
4th Grade	1977	3.9	3.8	3.8	32	4.0	3.9	3.4	3.7	4.5	4.0	4.0	3.8	33	3.9
2nd Grade	1974	NA	NA	1.6		NA	NA	NA	1.9	NA	NA	NA	1.9		1.8
3rd Grade	1975	NA	NA	2.9	29	NA	NA	NA	2.5	NA	NA	NA	2.8	23	2.3
4th Grade	1976	4.0	3.9	3.8	32	4.2	3.9	3.8	4.0	4.6	4.0	3.9	3.9	34	4.1
5th Grade	1977	4.9	4.8	5.0	37	5.2	4.9	4.8	4.9	5.2	5.0	5.1	5.3	40	5.0
3rd Grade	1974	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA		NA
4th Grade	1975	3.9	4.0	3.6	29	4.1	4.0	3.9	3.9	4.5	4.1	4.2	4.0	36	4.0
5th Grade	1976	4.8	4.7	5.0	37	4.7	4.9	4.8	4.8	5.4	4.8	5.0	5.3	40	4.9
6th Grade	1977	5.6	5.6	5.7	37	7.0	6.2	5.4	5.8	6.4	6.0	6.0	5.9	39	5.9
4th Grade	1974	NA	NA	3.0		NA	NA	NA	3.2	NA	NA	NA	3.4		3.1
5th Grade	1975	4.7	4.9	4.5	31	5.0	4.8	4.6	4.7	5.4	5.2	5.0	5.1	36	4.9
6th Grade	1976	5.7	5.7	4.7	38	5.5	6.2	5.3	5.5	6.4	6.0	6.1	5.9	39	5.8
7th Grade	1977	6.4	5.8	6.3	36	6.5	5.9	5.9	5.9	7.7	6.8	7.0	7.4	47	6.6
5th Grade	1974	NA	NA	3.5		NA	NA	NA	3.2	NA	NA	NA	3.4		3.4
6th Grade	1975	5.6	5.7	5.2	32	6.0	5.7	5.7	5.7	6.1	5.9	5.8	5.8	39	5.7
7th Grade	1976	6.6	6.3	6.8	41	6.5	6.1	6.5	6.1	7.0	6.4	6.7	6.7	41	6.6
8th Grade	1977	7.8	8.0	7.8	40	7.6	7.5	7.5	7.5	8.5	8.1	7.9	8.4	47	7.9


LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN READING ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
4th Sept. '74
4th May '75
5th Sept. '75
5th May '76
6th Sept. '76
6th May '77
7th Sept. '77
7th May '78
8th
8th

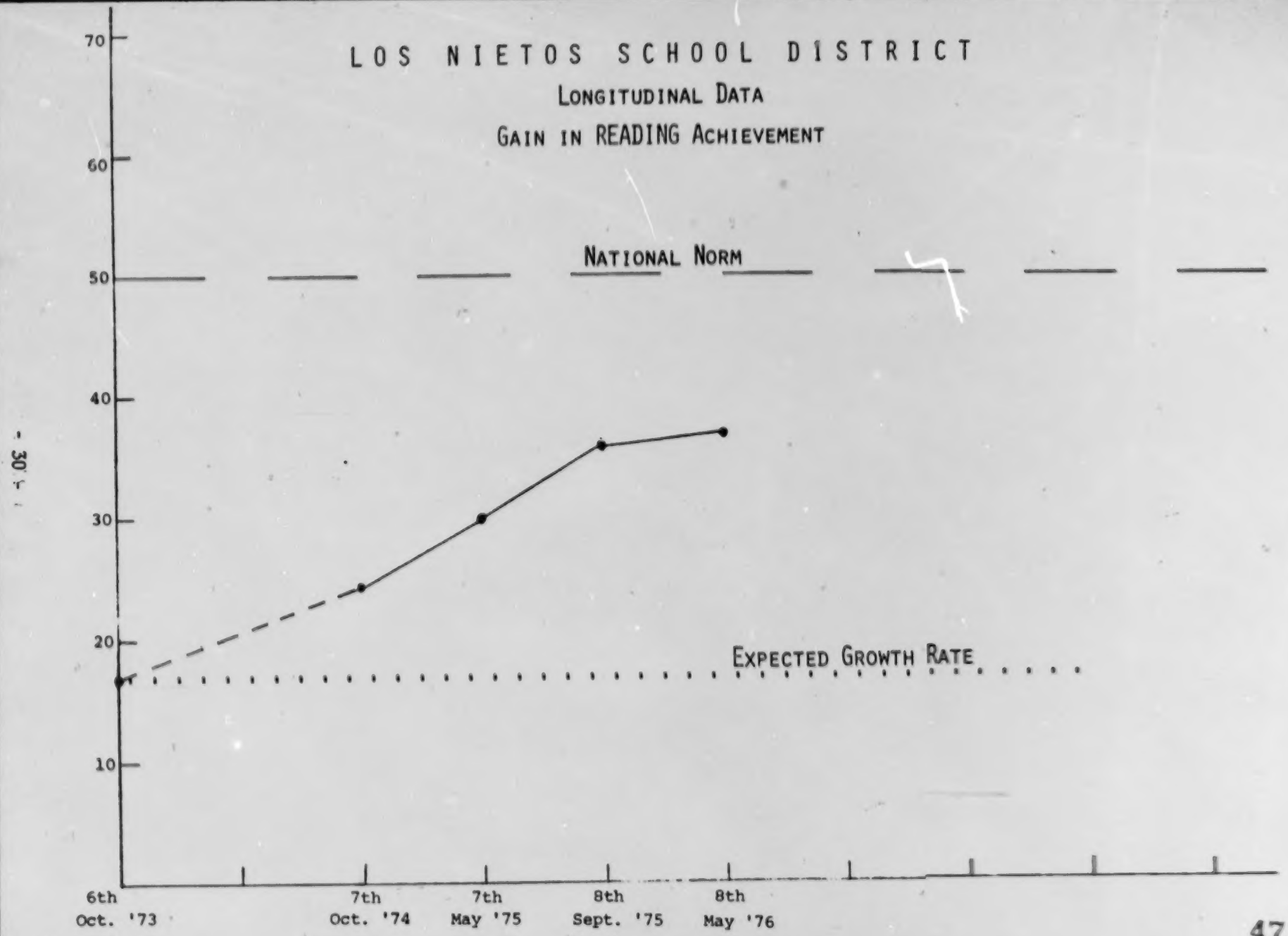

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN READING ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
4th Oct. '73
5th Oct. '74
5th May '75
6th Sept. '75
6th May '76
7th
7th
8th
8th

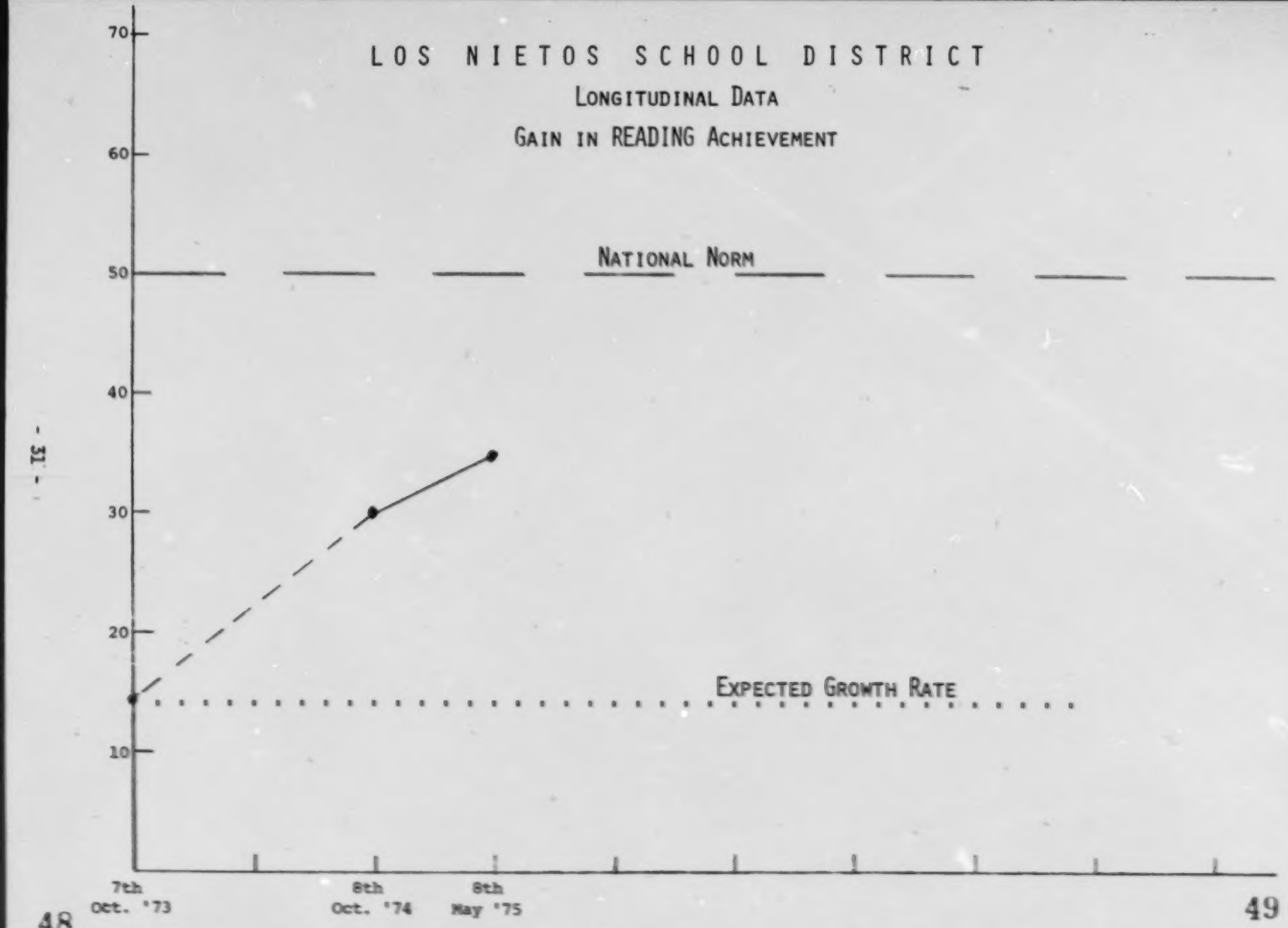

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN READING ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
5th Oct. '73
6th Oct. '74
6th May '75
7th Sept. '75
7th May '76
8th Sept. '76
8th May '77

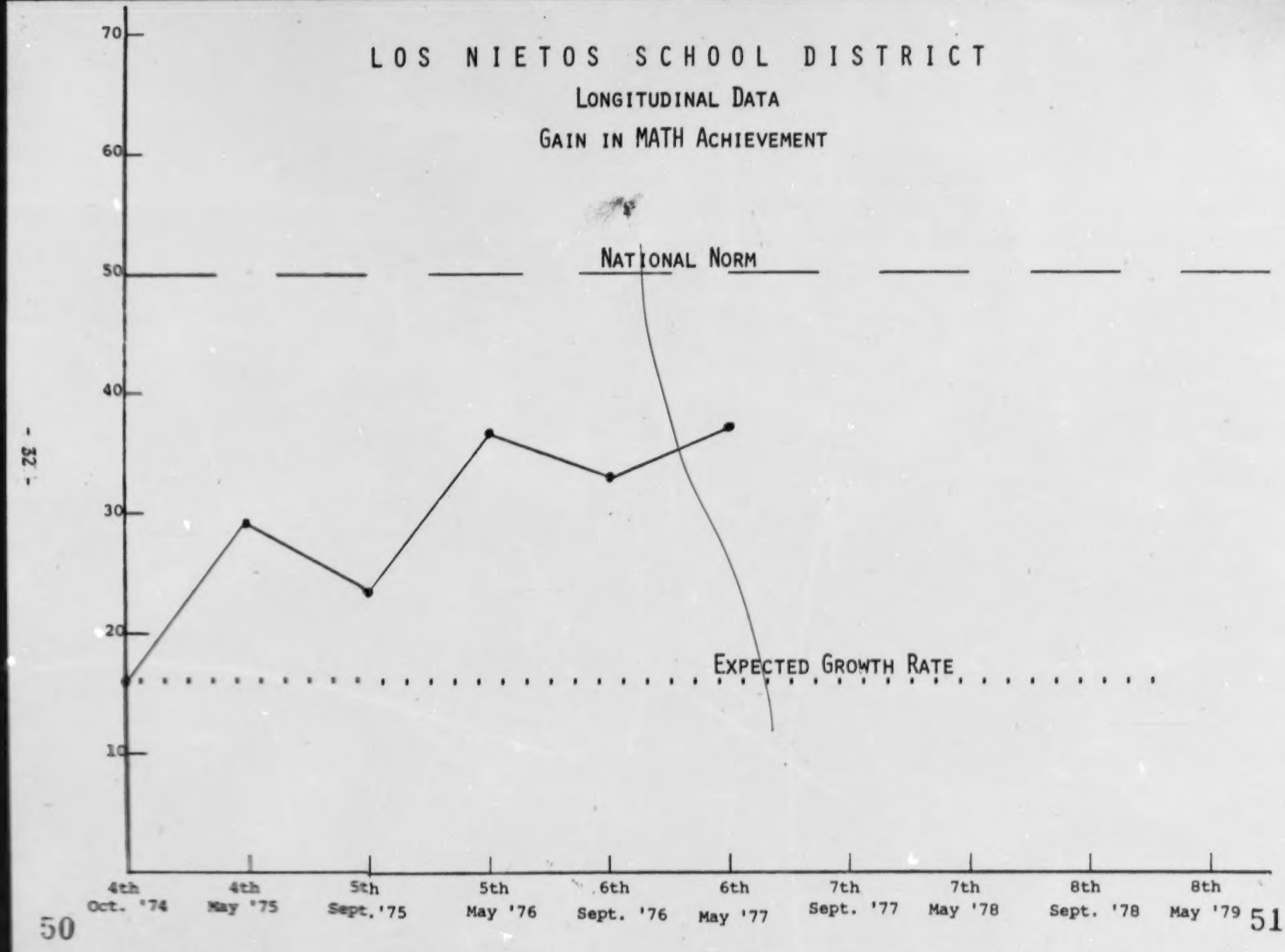
LOS NIETOS SCHOOL DISTRICT

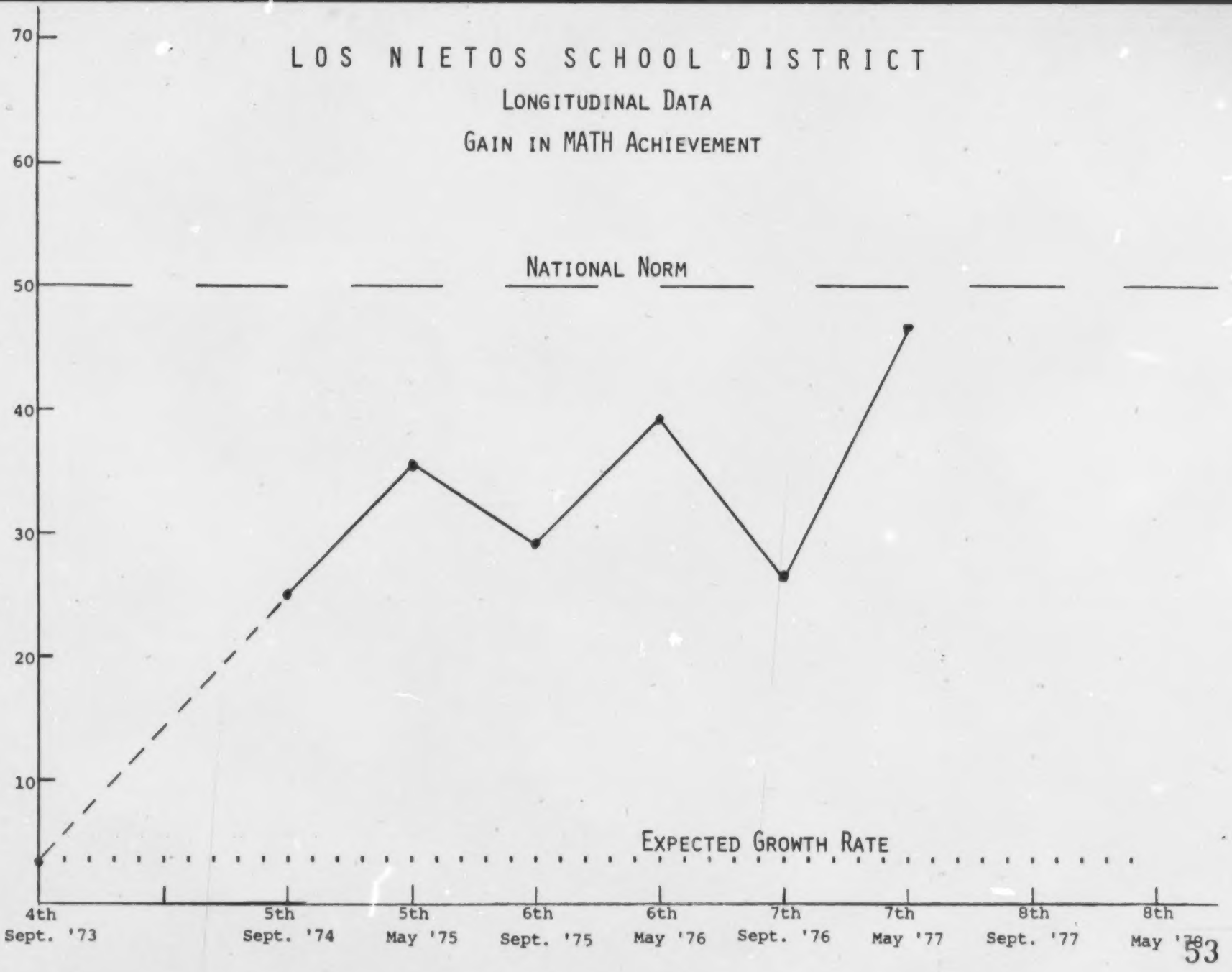
LONGITUDINAL DATA

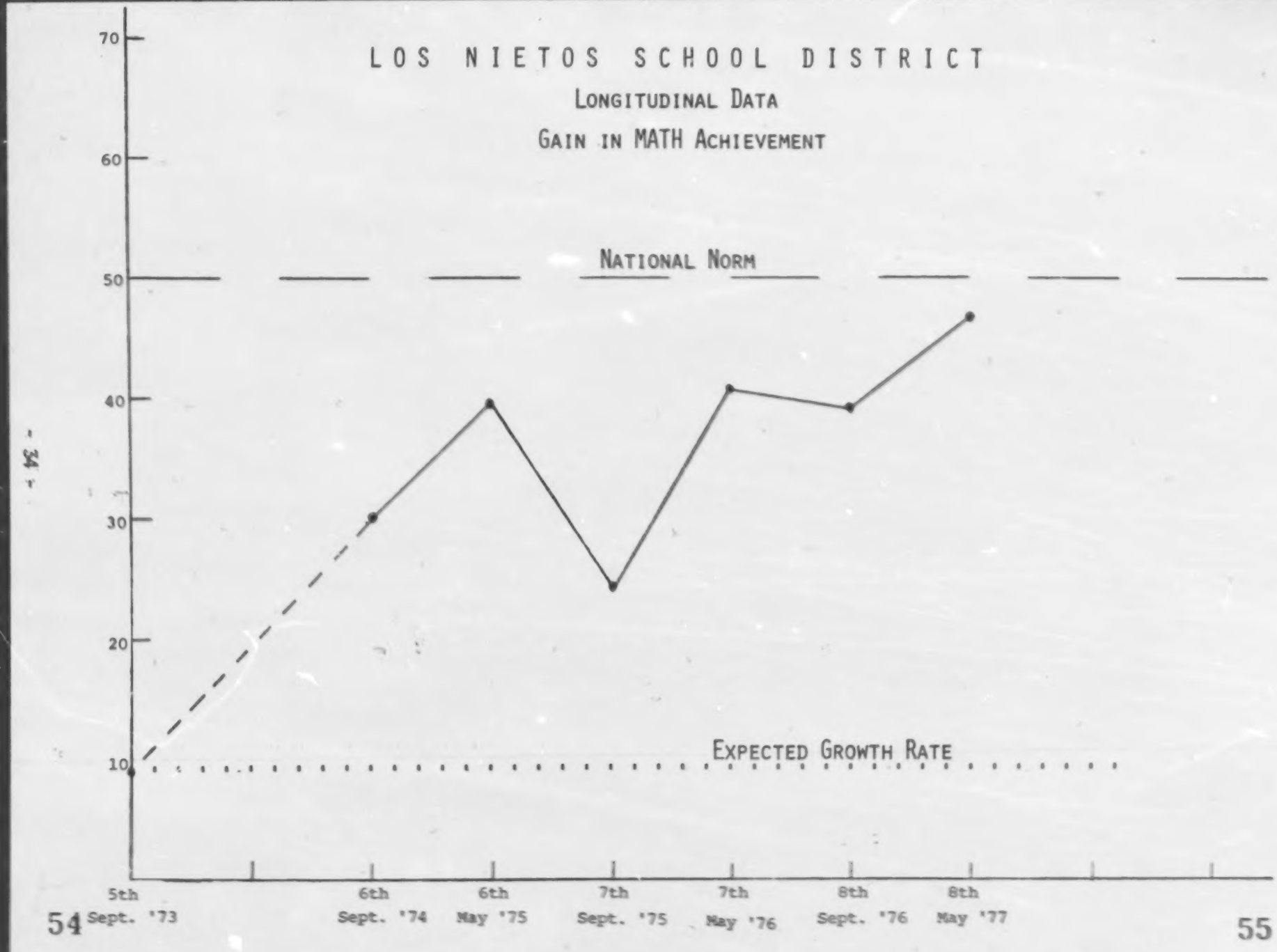
GAIN IN READING ACHIEVEMENT

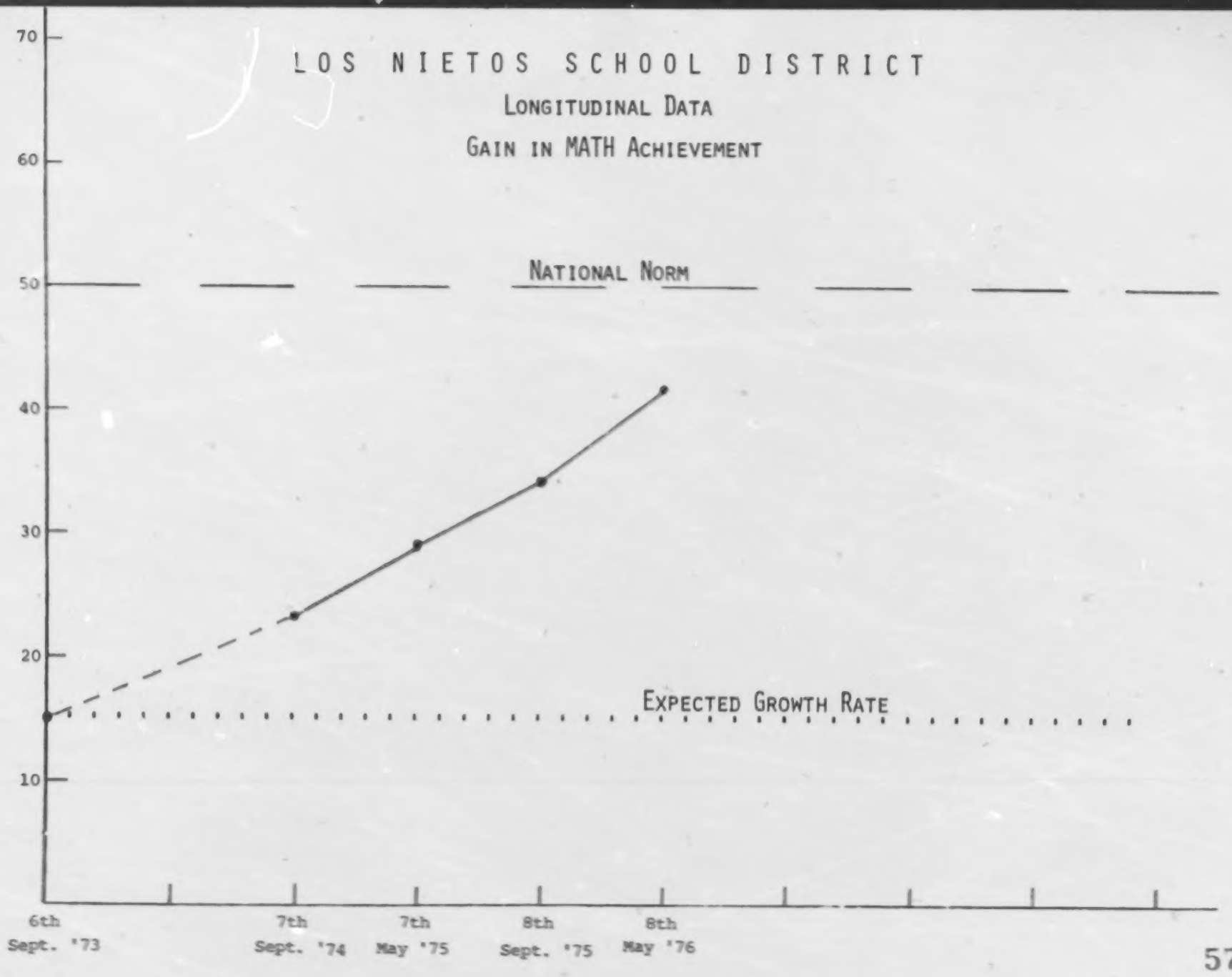


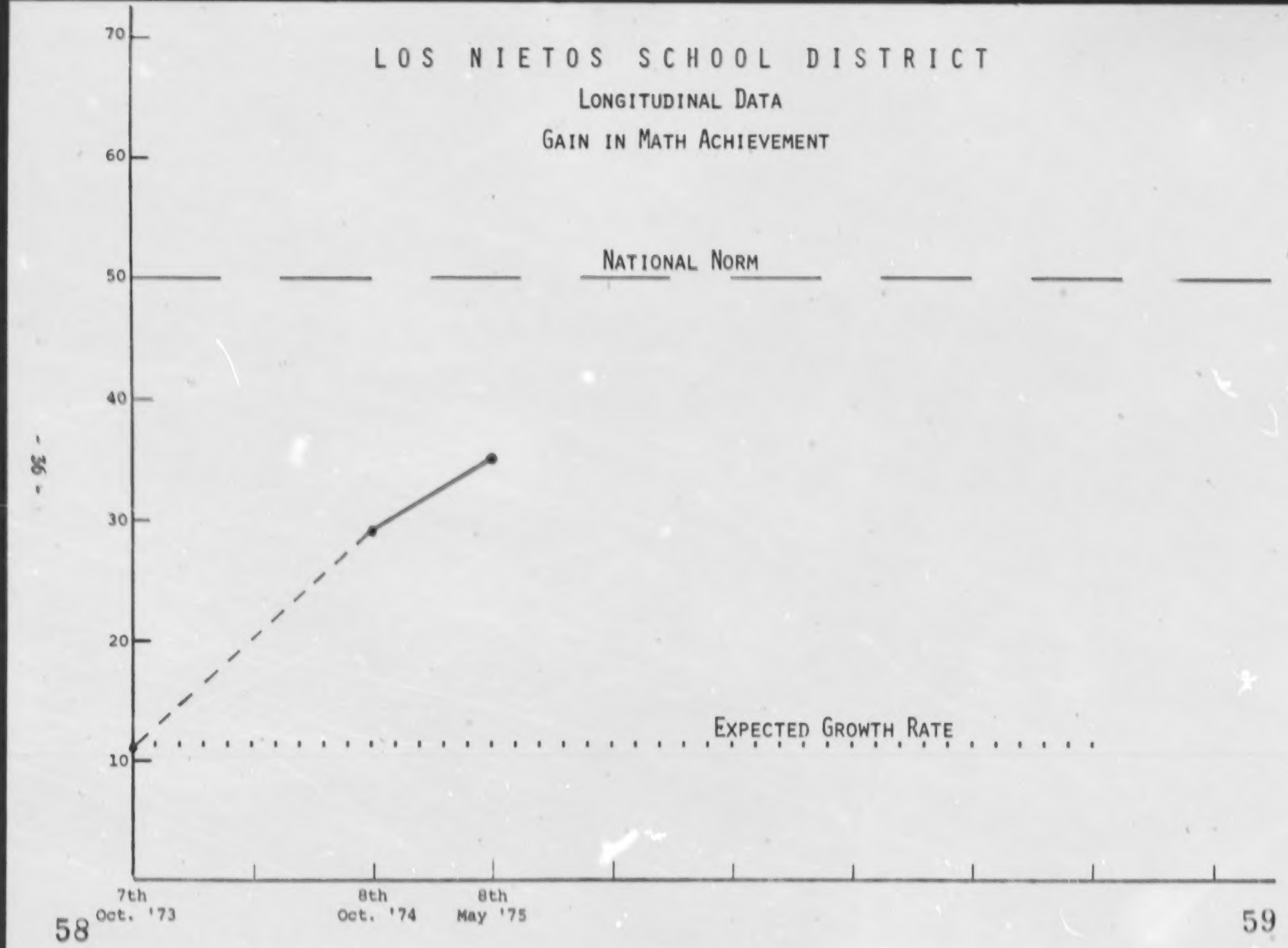

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN READING ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
7th
Oct. '73
8th
Oct. '74
8th
May '75

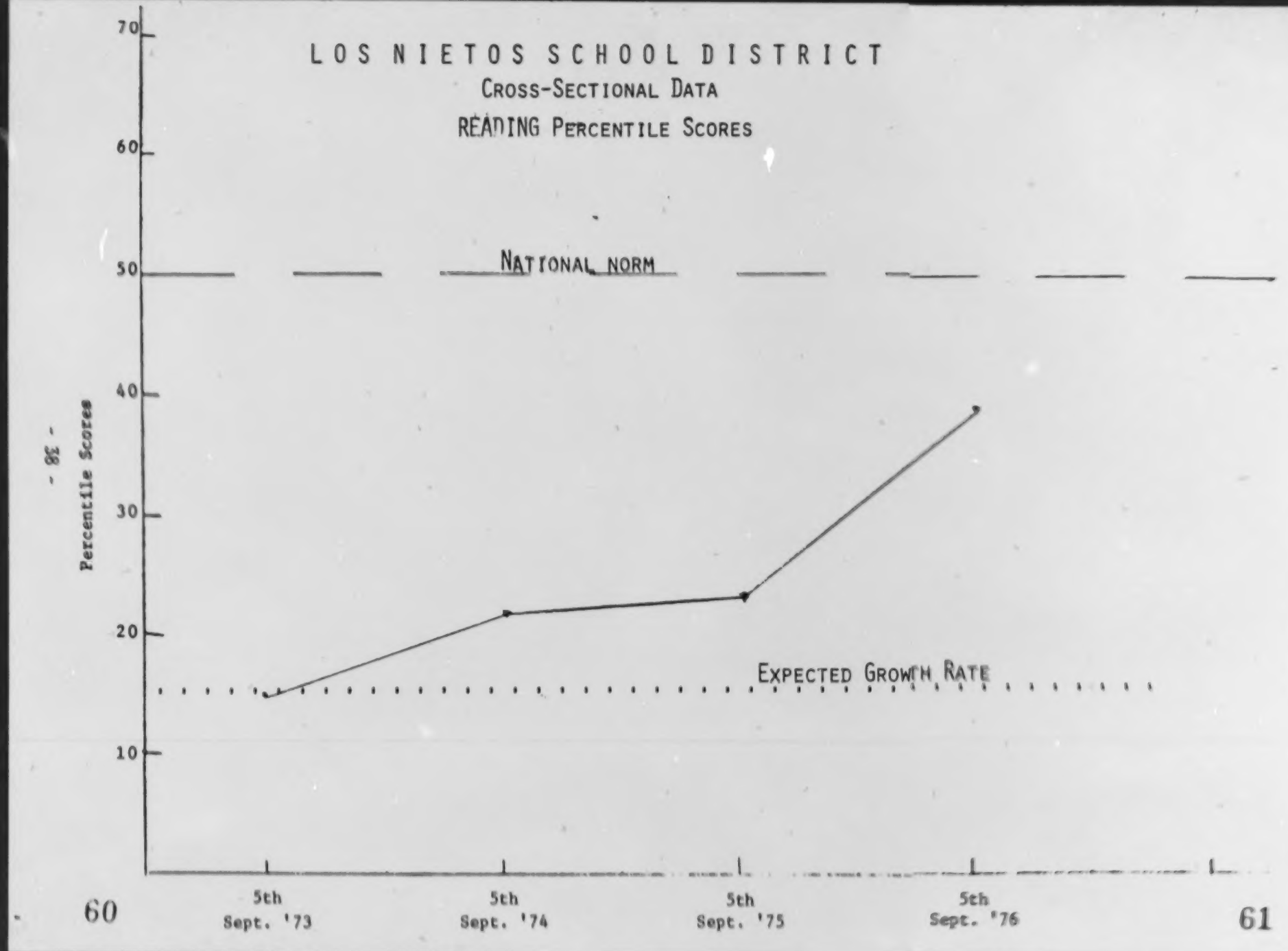

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN MATH ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
4th Oct. '74
4th May '75
5th Sept. '75
5th May '76
6th Sept. '76
6th May '77
7th Sept. '77
7th May '78
8th Sept. '78
8th May '79

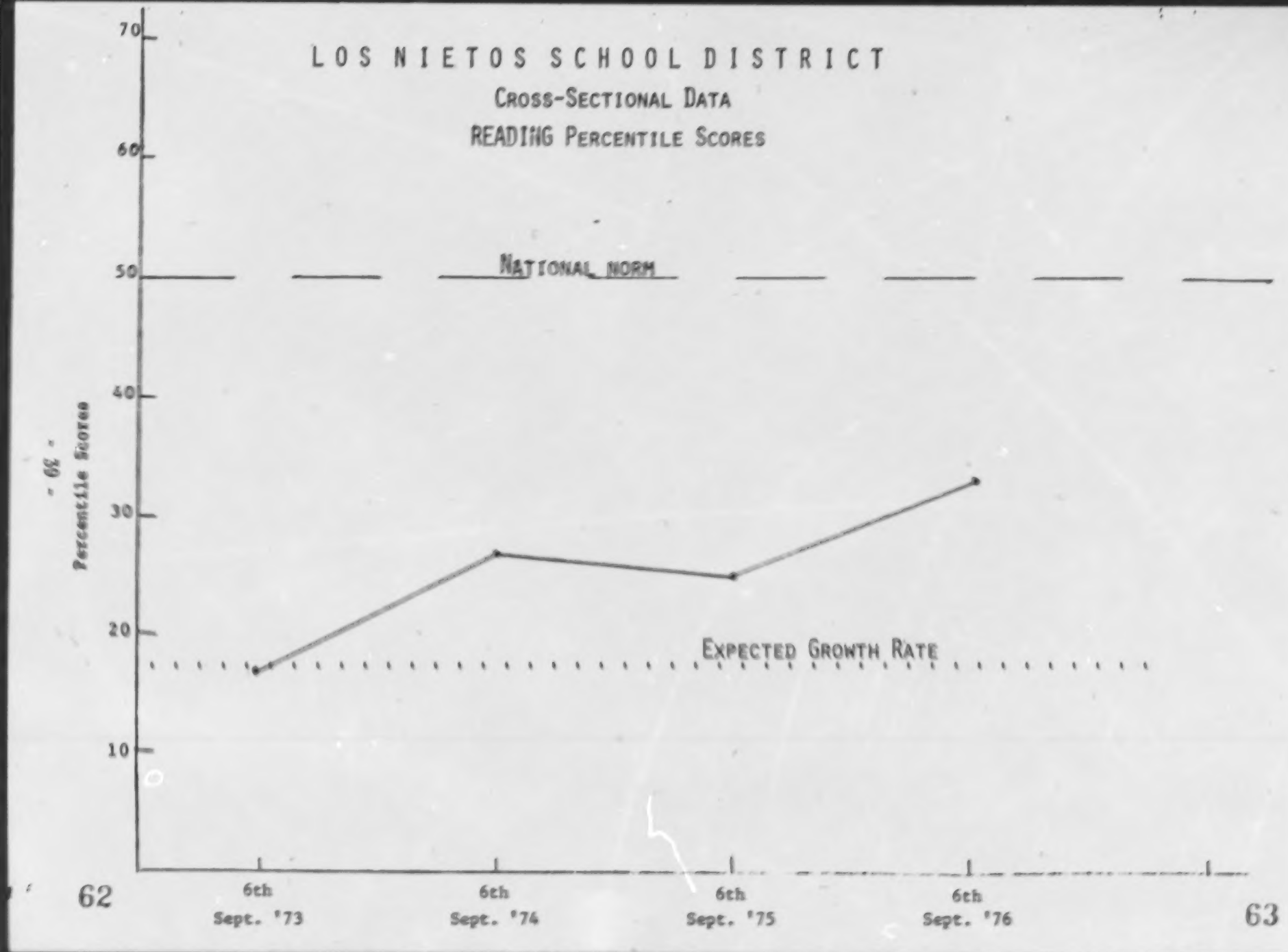

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN MATH ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
4th Sept. '73
5th Sept. '74
5th May '75
6th Sept. '75
6th May '76
7th Sept. '76
7th May '77
8th Sept. '77
8th May '78

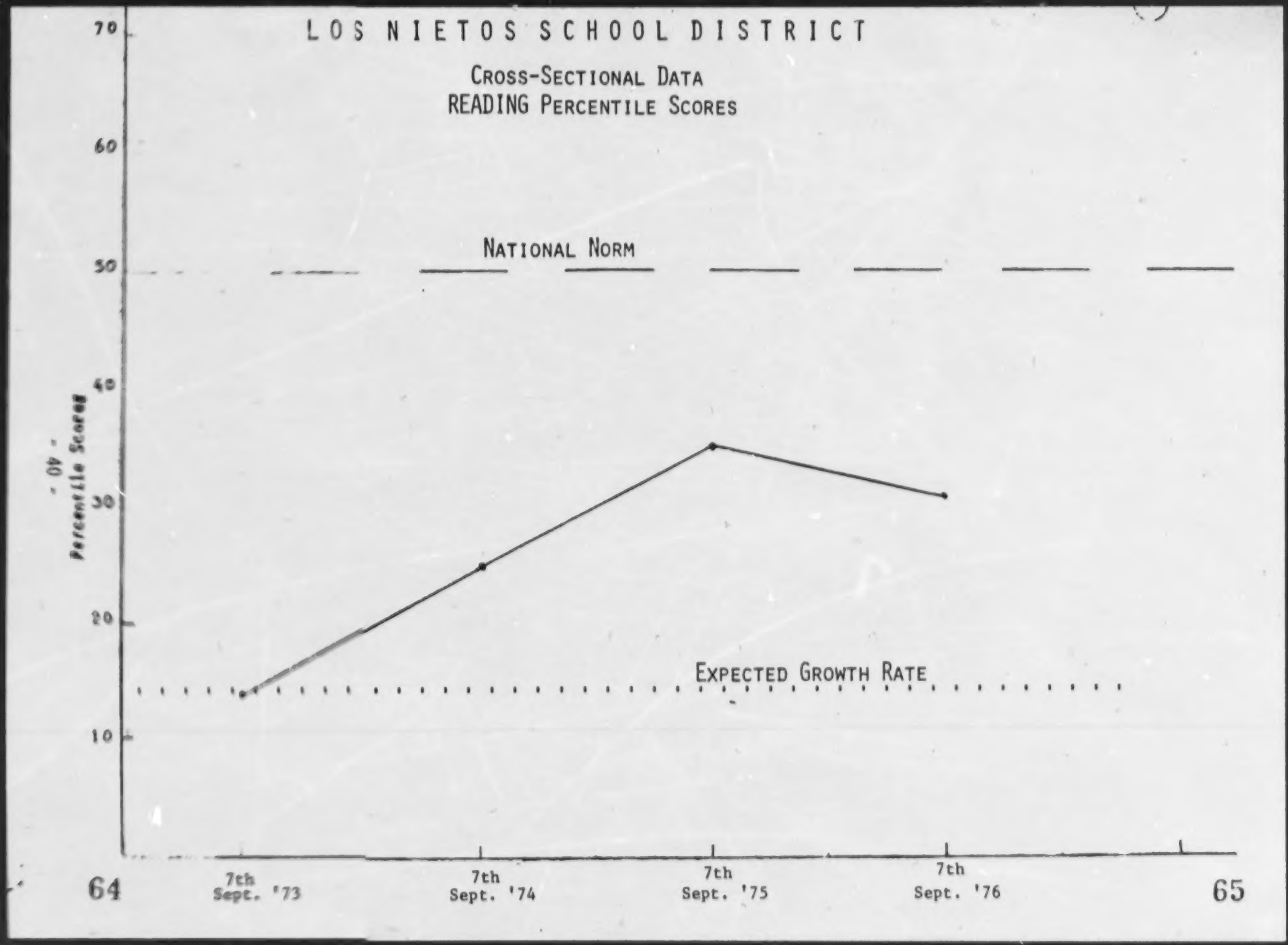

LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN MATH ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
5th Sept. '73
6th Sept. '74
6th May '75
7th Sept. '75
7th May '76
8th Sept. '76
8th May '77


LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN MATH ACHIEVEMENT
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
6th
Sept. '73
7th
Sept. '74
7th
May '75
8th
Sept. '75
8th
May '76


LOS NIETOS SCHOOL DISTRICT
LONGITUDINAL DATA
GAIN IN MATH ACHIEVEMENT
NATIONAL NORM
EXPECTED GROWTH RATE
70
60
50
40
30
20
10
7th
Oct. '73
8th
Oct. '74
8th
May '75

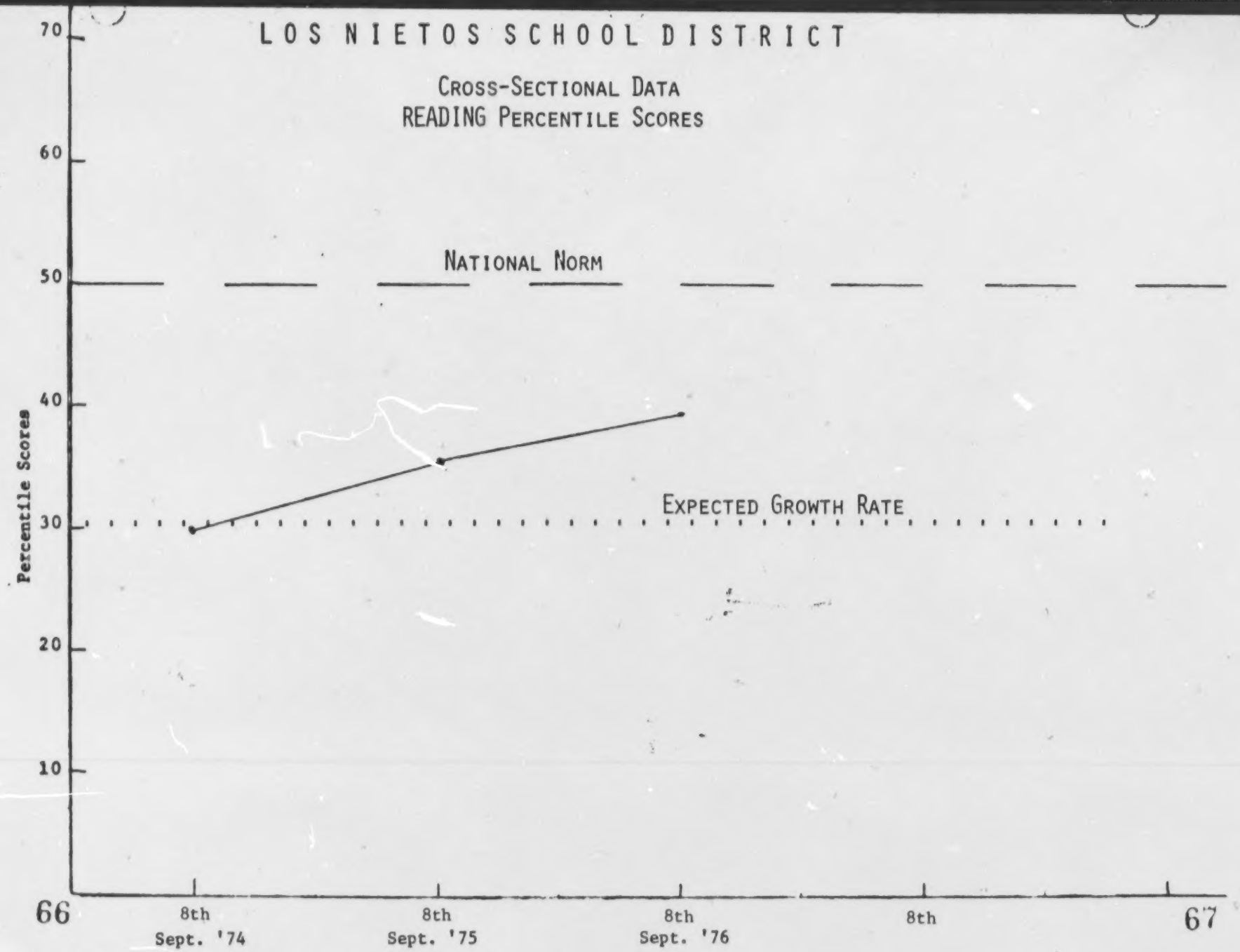

LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
READING PERCENTILE SCORES
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
5th Sept. '73
5th Sept. '74
5th Sept. '75
5th Sept. '76


LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
READING PERCENTILE SCORES
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
6th
Sept. '73
6th
Sept. '74
6th
Sept. '75
6th
Sept. '76


LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
READING PERCENTILE SCORES
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
7th Sept. '73
7th Sept. '74
7th Sept. '75
7th Sept. '76

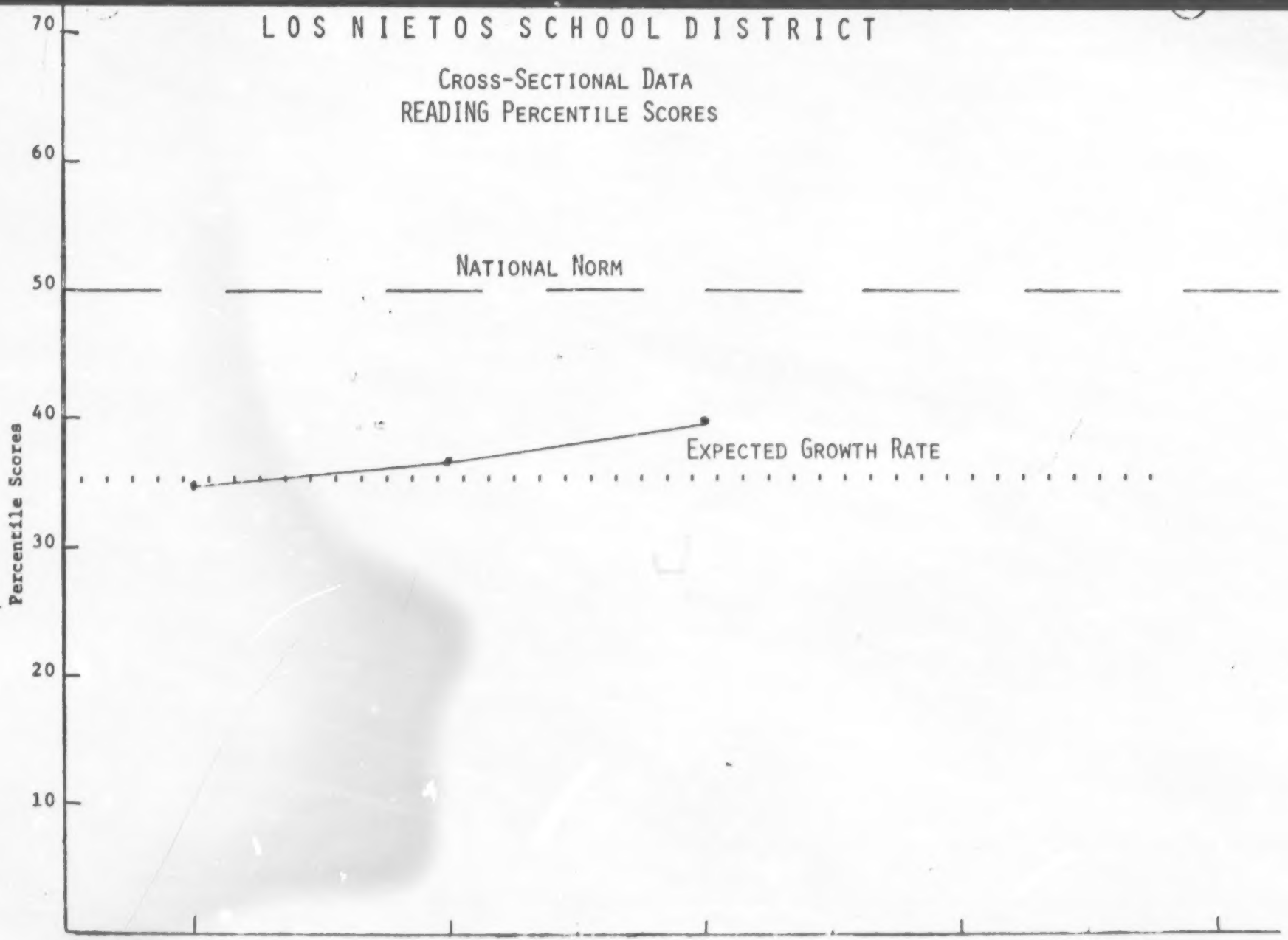
LOS NIETOS SCHOOL DISTRICT

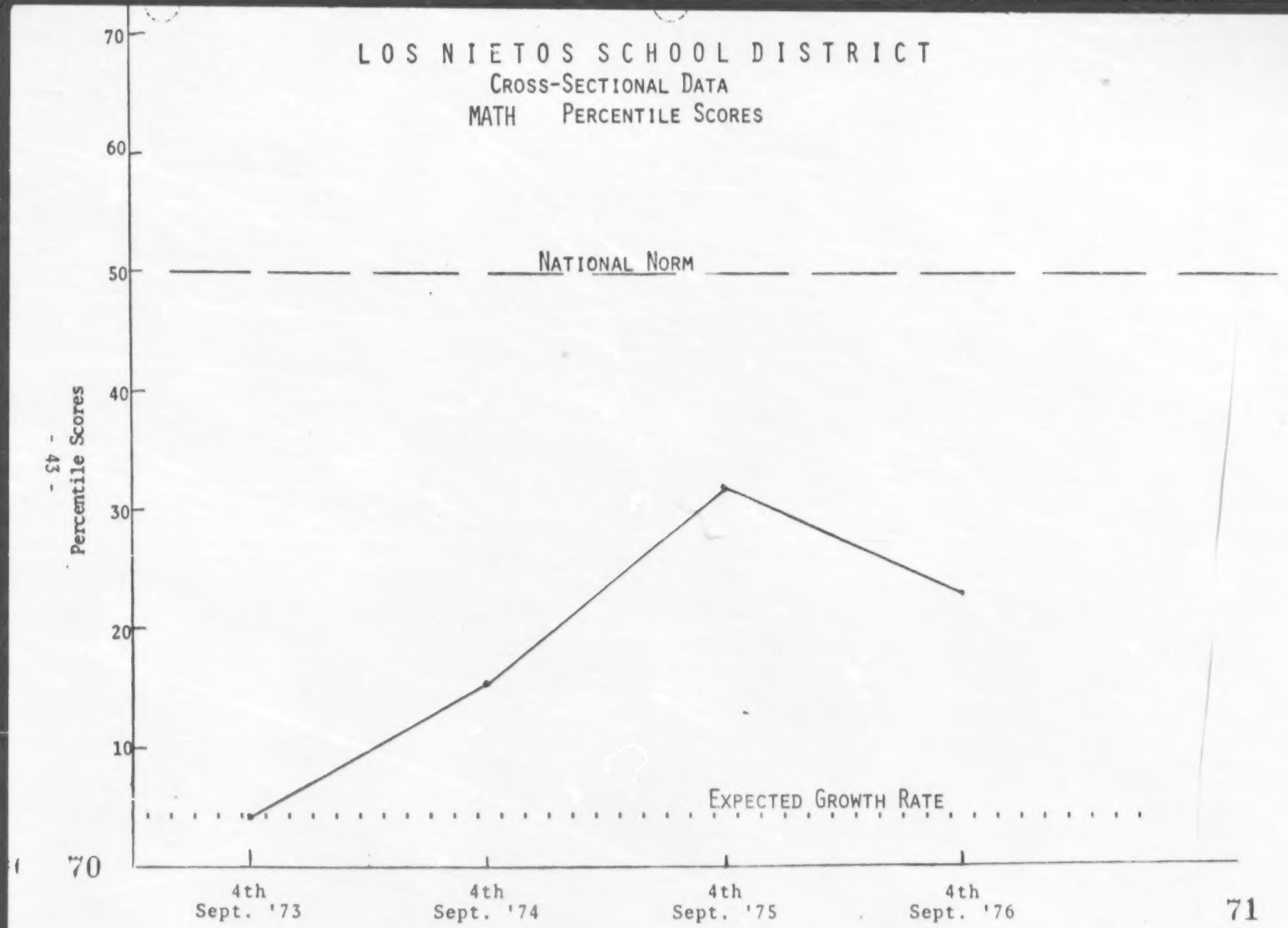
Cross-Sectional Data
READING Percentile Scores



LOS NIETOS SCHOOL DISTRICT

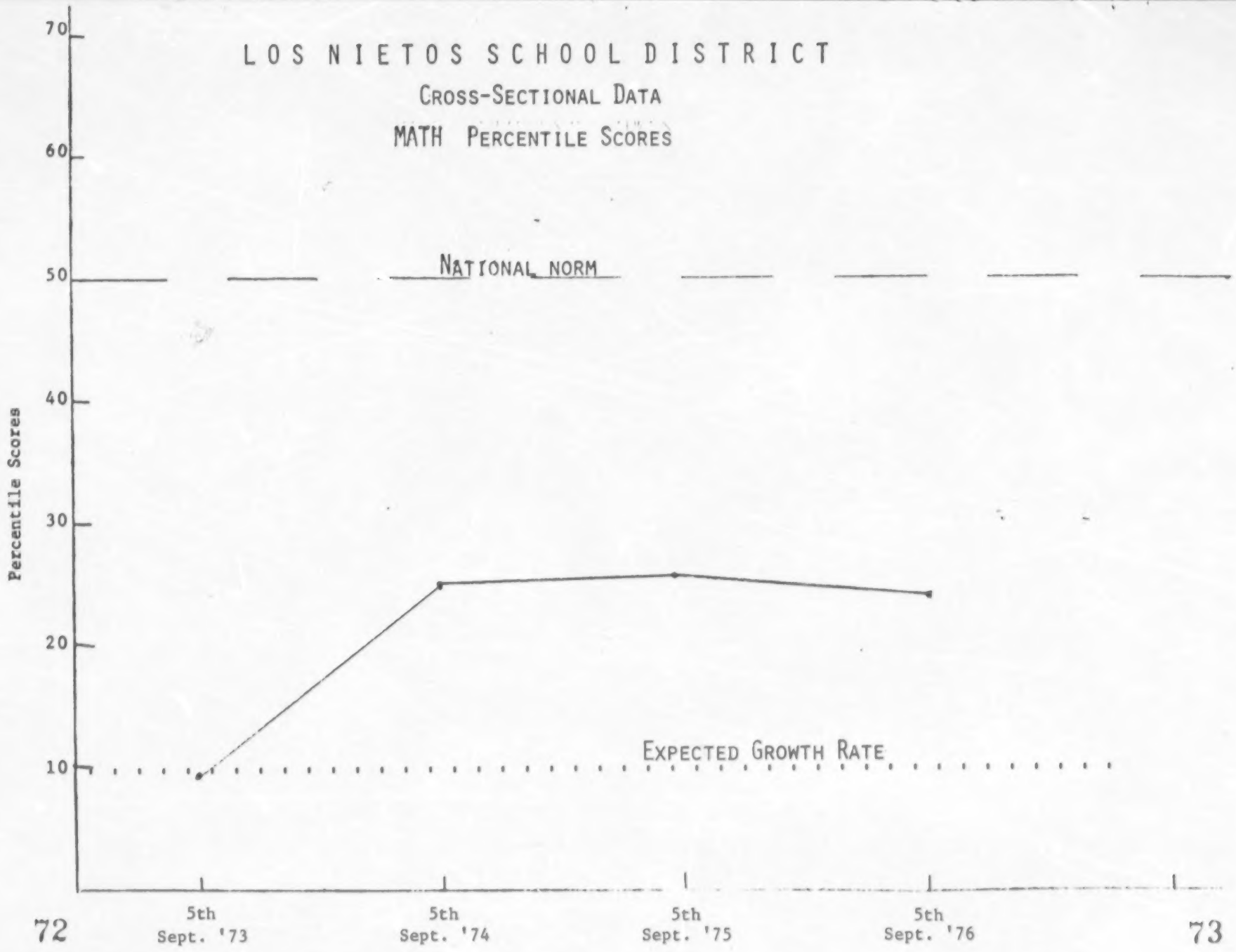
CROSS-SECTIONAL DATA
READING PERCENTILE SCORES

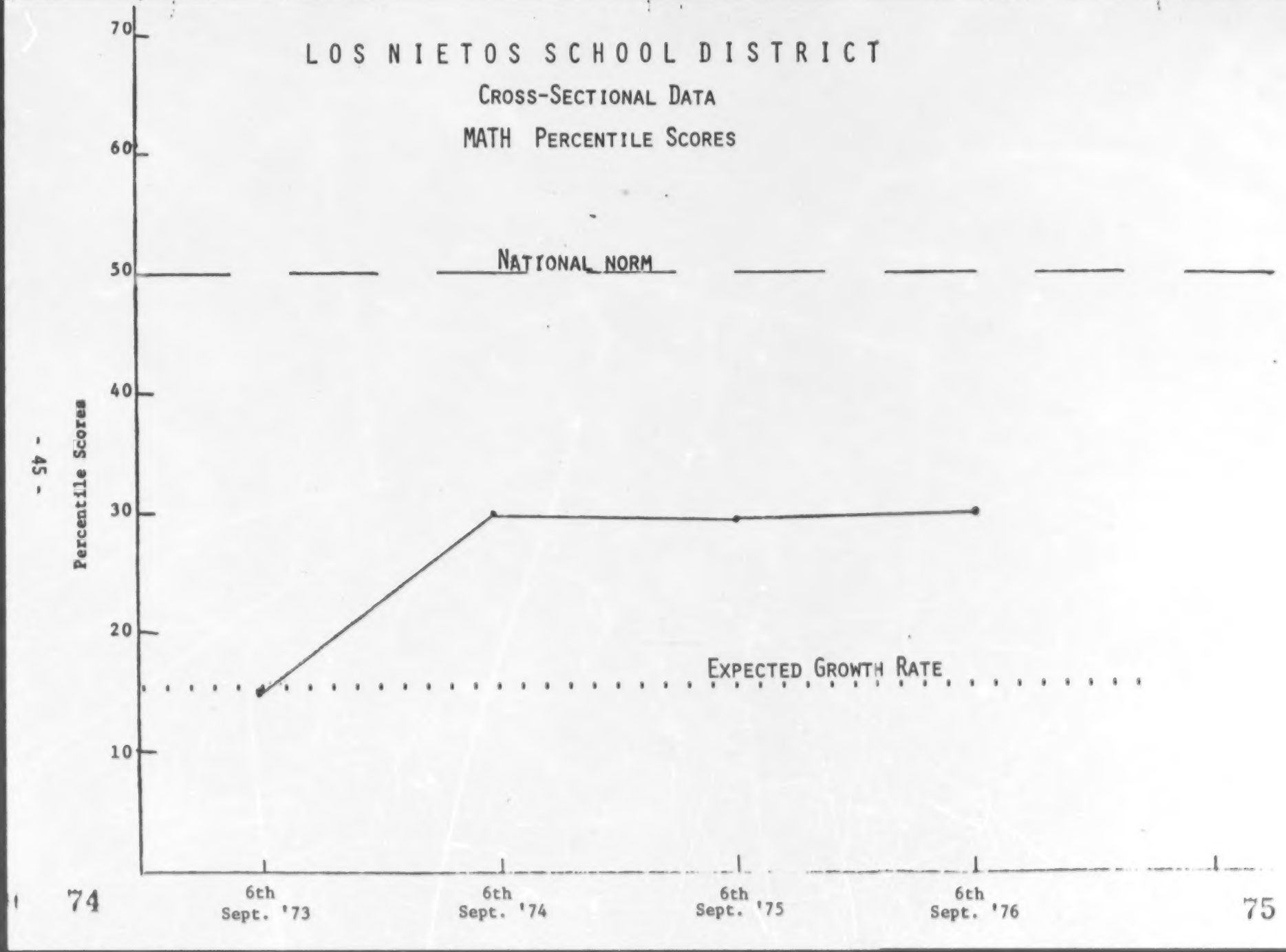



LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
MATH PERCENTILE SCORES
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
4th Sept. '73
4th Sept. '74
4th Sept. '75
4th Sept. '76

70

71


LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
MATH PERCENTILE SCORES
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
70
60
50
40
30
20
10
5th Sept. '73
5th Sept. '74
5th Sept. '75
5th Sept. '76

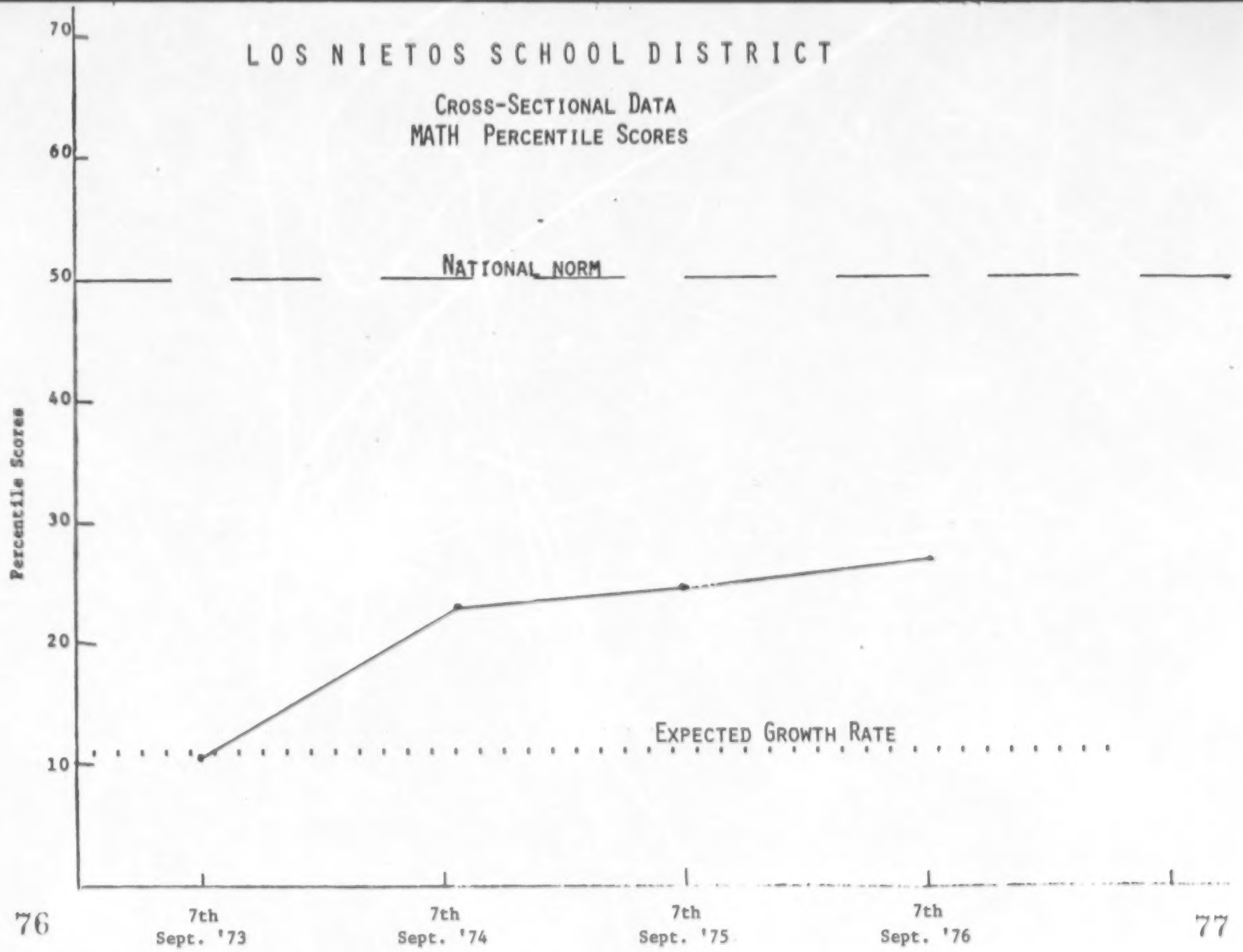

LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
MATH PERCENTILE SCORES
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
70
60
50
40
30
20
10
6th Sept. '73
6th Sept. '74
6th Sept. '75
6th Sept. '76

74

75

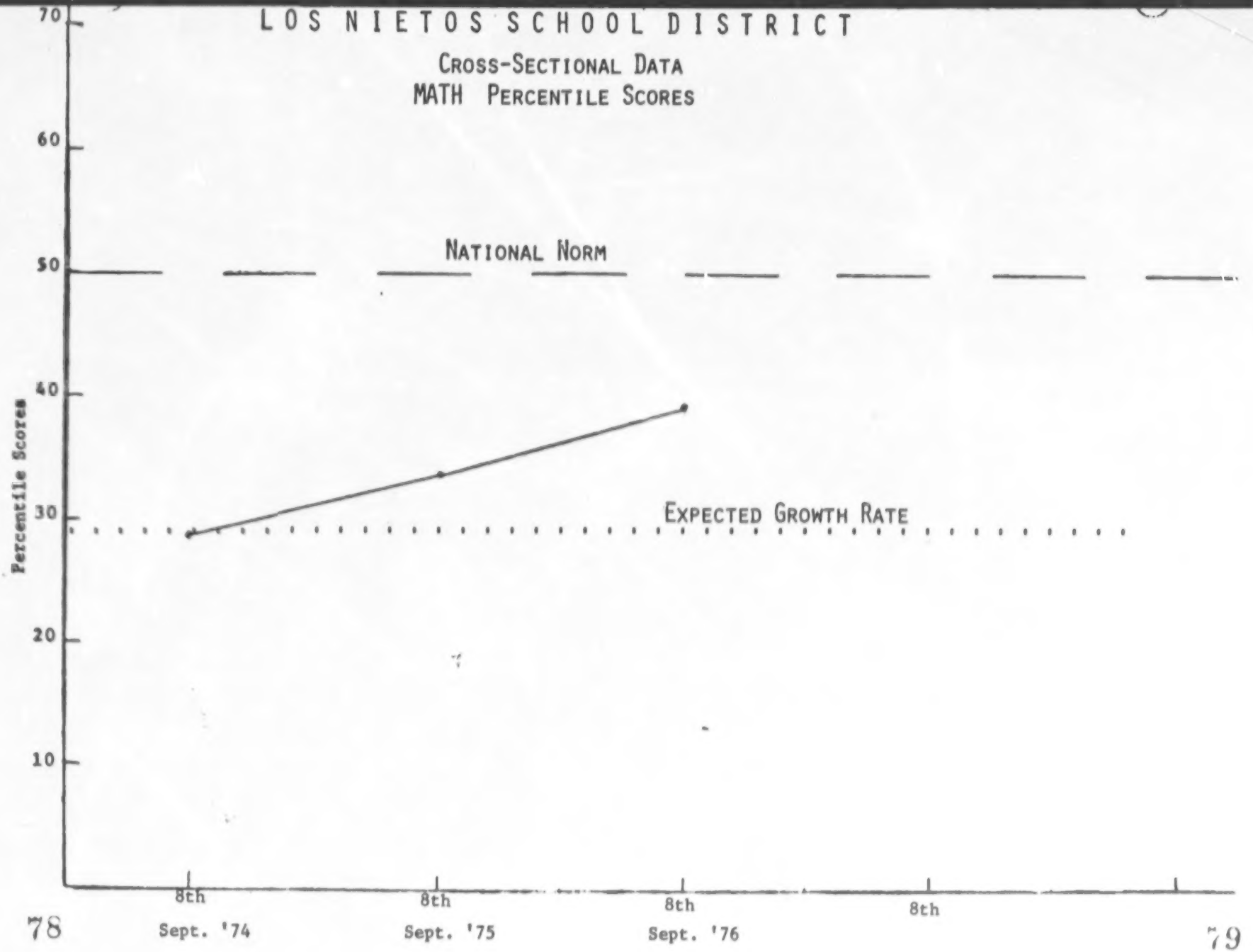
LOS NIETOS SCHOOL DISTRICT

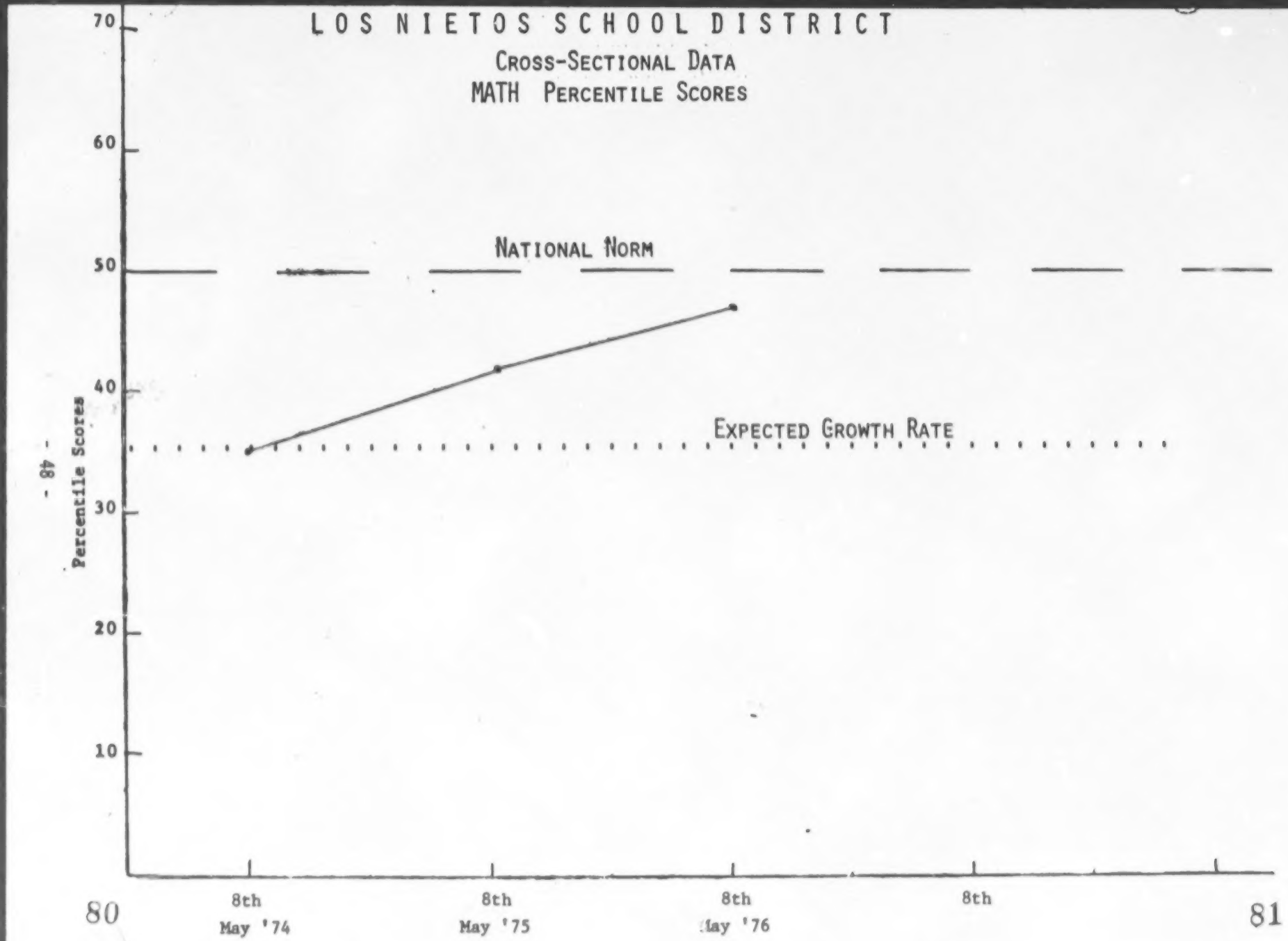
Cross-Sectional Data
MATH Percentile Scores



LOS NIETOS SCHOOL DISTRICT

CROSS-SECTIONAL DATA
MATH PERCENTILE SCORES




LOS NIETOS SCHOOL DISTRICT
CROSS-SECTIONAL DATA
MATH PERCENTILE SCORES
70
60
50
40
30
20
10
NATIONAL NORM
EXPECTED GROWTH RATE
Percentile Scores
8th
May '74
8th
May '75
8th
May '76
8th

80

81